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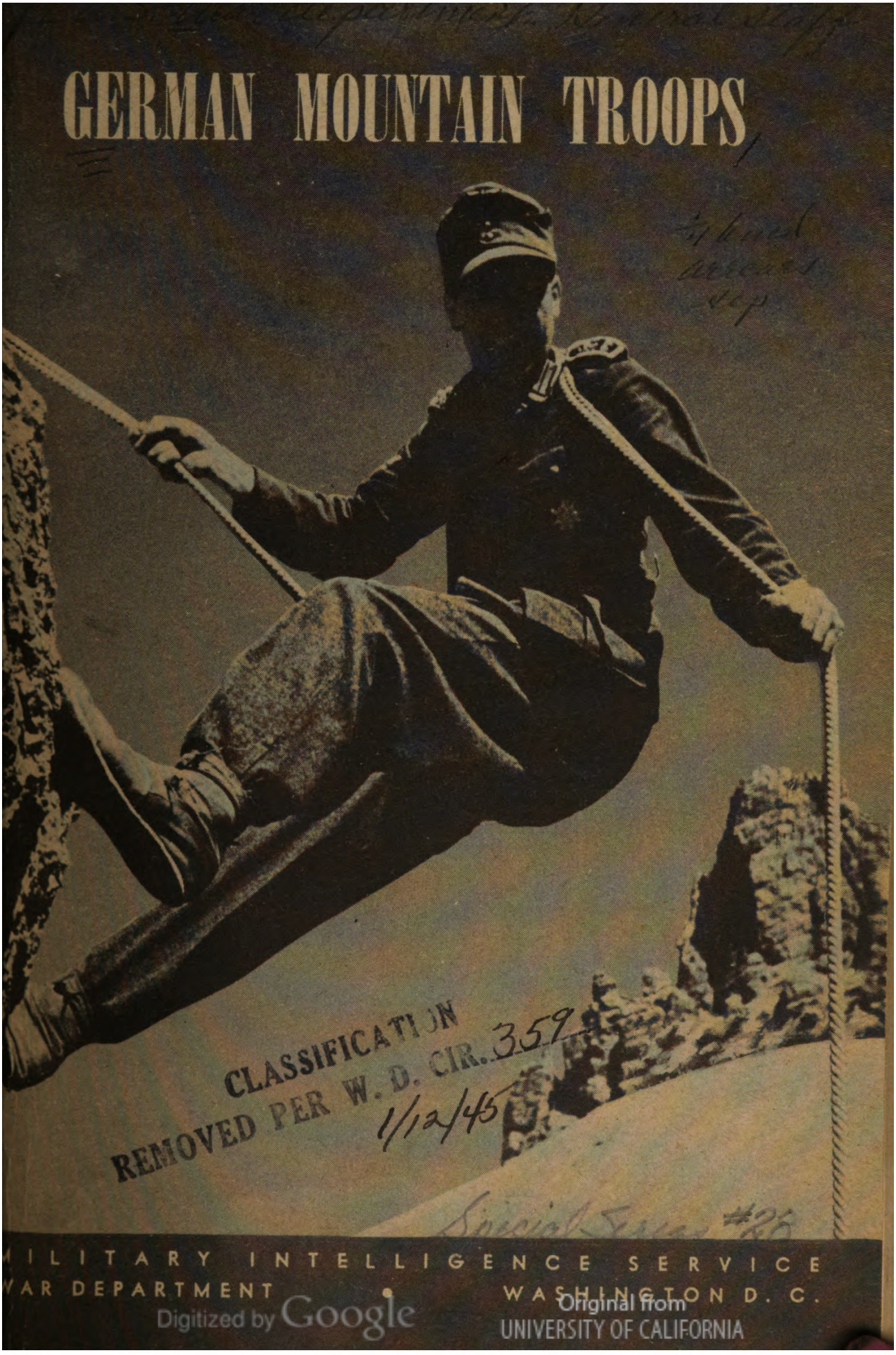
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GERMAN MOUNTAIN TROOPS



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SPECIAL SERIES 28 DECEMBER 1944

GERMAN MOUNTAIN TROOPS



MILITARY INTELLIGENCE SERVICE

WAR DEPARTMENT • WASHINGTON, D. C.

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The complexity of this prepared route in the Tirolian Adamello Massif indicates the state of development of mountain warfare in World War I.

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INTRODUCTION

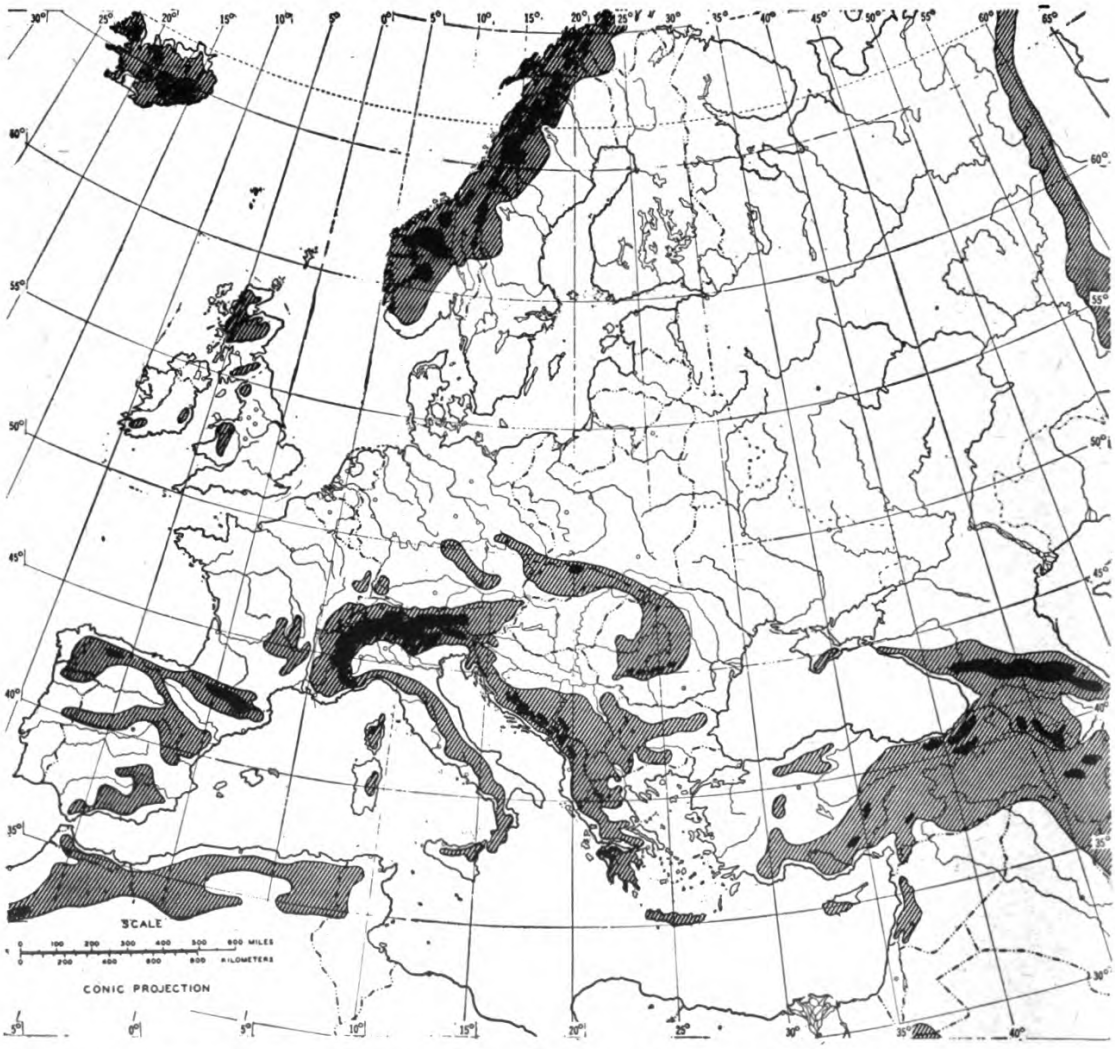
On the European Continent the proportion of rugged mountain terrain is comparatively small, but many of the most difficult masses have considerable strategic importance because they are national boundaries. (The strategic significance of the European ranges is indicated in the map on p. 2.) In evaluating the significance of these mountains in its war plans, the German High Command followed two fundamental lines: Mountain masses must be exploited as defensive barriers; in an offensive campaign they must be forced in order to reach and destroy the enemy in his own country.

As a result of lessons learned by the German and other European armies, the German High Command reached the conclusions that ruggedness of terrain is a critical factor, and that mountain operations require troops who are specially selected, trained, and equipped. It was believed, however, that the extent to which mountain troops should be employed is affected by the degree of steepness and rockiness and by the number of trails of the mountainous region in which operations are planned. Consequently, the Germans may, when forming a task force, use ordinary troops with a small cadre of mountaineers in relatively easy mountain terrain, but in alpine regions they use mountain troops exclusively.

Present German mountain units, tactics, techniques, and equipment are the culmination of a long period of growth. Little attention was paid to mountain warfare in European armies till the Russo-Turkish War of 1877–78, when lack of mountaineering skill caused a loss of 10 percent of the forces involved. As result of this lesson, the French Army founded the *Chasseurs Alpins*. At the same time Italy intensified the development

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of her *Alpini* companies which had been organized as early as 1872. Of the larger armies of central and western Europe, only the German remained without a mountain training program. The reason for this was that the Imperial High Command relied on the Austro-Hungarian and Italian armies to furnish mountain troops for any possible conflict involving the French *Chasseurs* in the Vosges. Austria-Hungary, with its extensive alpine regions, had many born alpinists in the *Tiroler Kaiserjäger* (Imperial Tirolese Foresters—a type of light infantry). Even prior to the organization of officially designated mountain troops (*Landesschützen*) in 1907, the Austro-Hungarian Army had mountain artillery and mountain supply trains

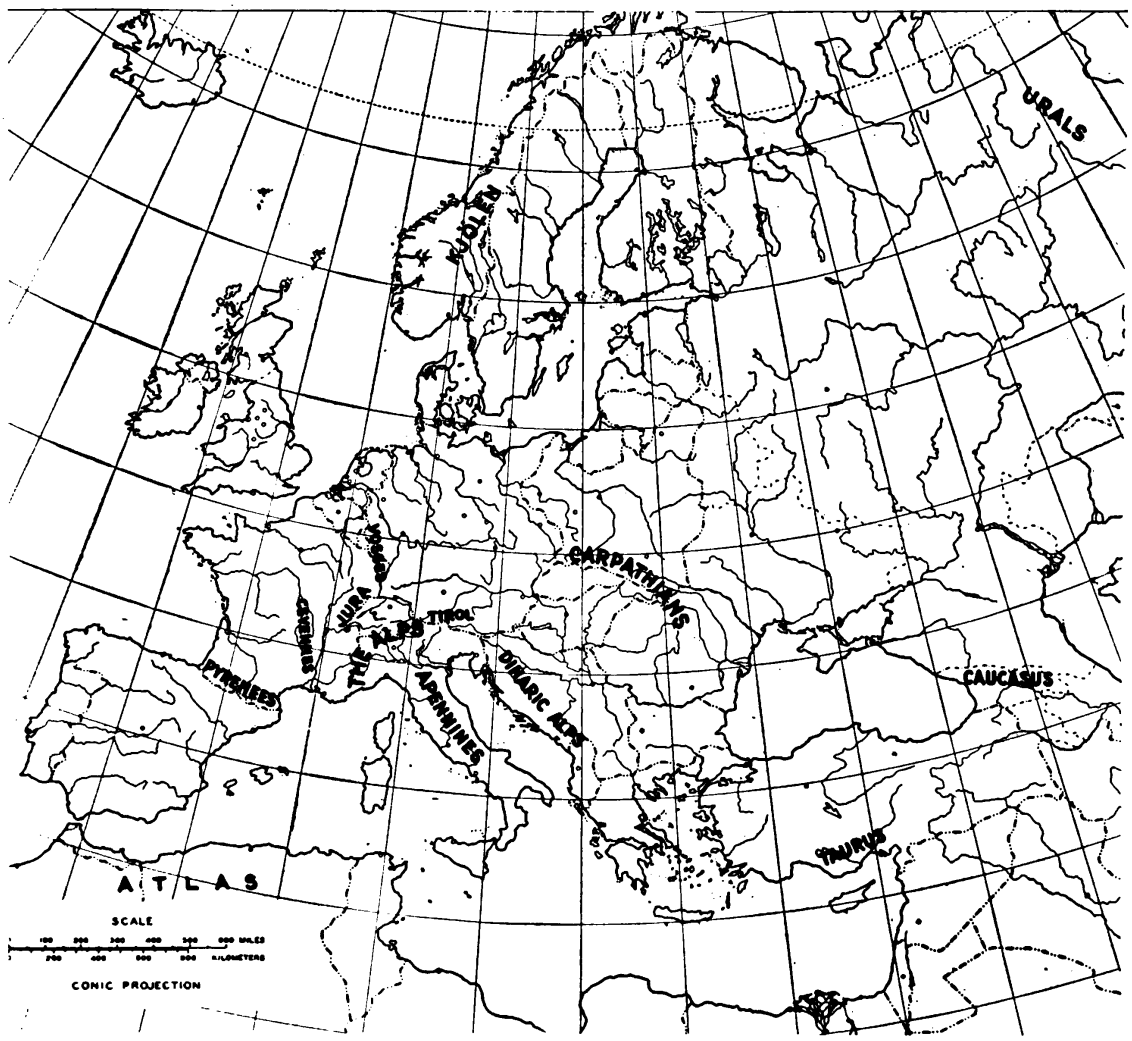


This map, which shows degree of ruggedness rather than altitude, illustrates German principles: ordinary troops, stiffened with mountaineers, are used in shaded areas; mountain troops are used exclusively in regions shown in black.

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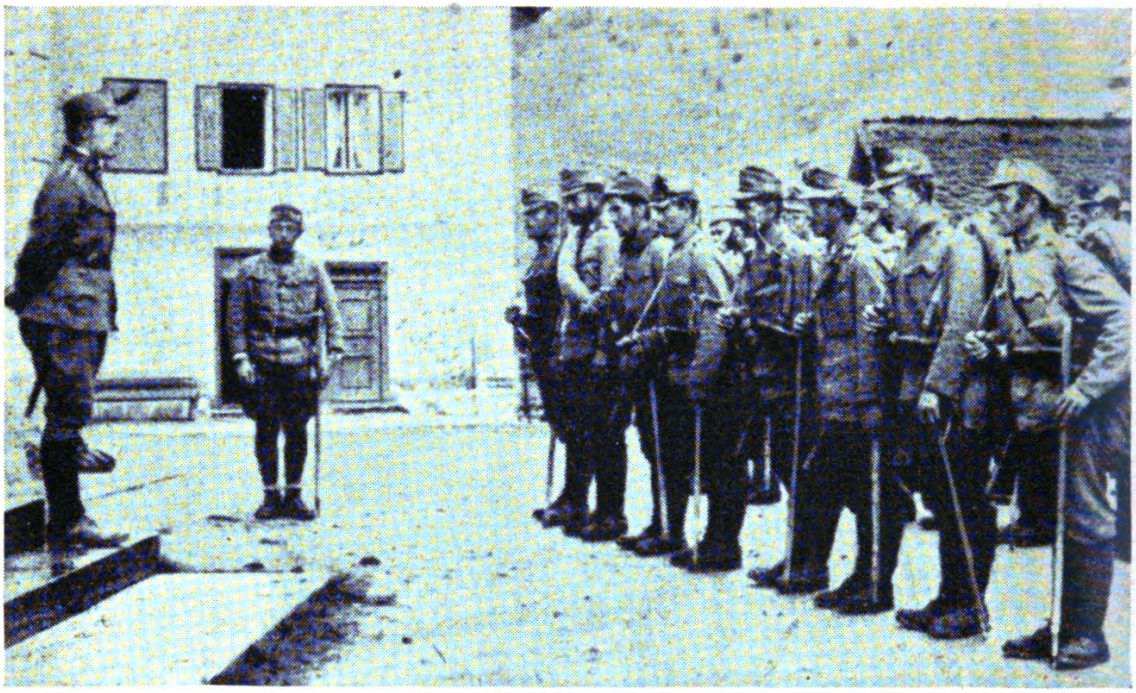
to cooperate with Tirolese and other troops native to mountains. By 1914, the regular Austrian Army could muster as many as 74 mountain batteries, although the total number of field artillery batteries was only 331.

At the outbreak of World War I, however, Germany not only found herself without specially trained mountain troops and mountain artillery, but also received no outside aid. Austria-Hungary was fully engaged against the Russians and could not spare any mountain troops. Germany's embarrassment became complete when Italy withdrew from the Triple Alliance and joined the Allies. Germany was compelled to pit ordinary troops against the *Chasseurs Alpins* in the Vosges.



The map above identifies by name the mountain masses outlined in the map on the opposite page. The principality of Montenegro (today the Yugoslav province of Zetska) is located adjacent to the word "Alps" in "Dinaric Alps".

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The derivation of the German mountain uniform of today from the Austrian *Jäger* uniform of 1914–18 is shown by the dress of this *Tiroler Kaiserjäger* garrison of the Trafoi ice cliff. Note visored caps, baggy trousers, wrap puttees.

In 1915, after Austria-Hungary had expended her trained mountaineers as ordinary troops in operations against the Russians, Germany called for volunteers with winter and mountain experience. Mountain artillery being lacking except in German colonial forces, batteries were equipped hastily with Krupp mountain guns and howitzers intended for the Chilean Army. After serving in emergency ski battalions and artillery units in the Vosges and Carpathians during the winter of 1914–15, these volunteers were combined with others with mountain experience in a new arm designated as the *Alpenkorps*. A majority of the new mountain troops were sent to the Italian front because the situation there was serious, and also because Germany saw the possibility for an eventual decisive success in the faulty conception which the Italians had concerning the employment of mountain troops. Ordinary Italian units were comparatively untrained for mountain fighting, and were not sufficiently stiffened with *Alpini* troops. Instead, the *Alpini* had been concentrated almost exclusively in tactical units for fighting in extremely difficult terrain, in which they were held in stalemate by trained Austro-Hungarian and German mountaineers. A consequence of the failure to bolster ordinary troops with *Alpini,* who could furnish technical advice on mountaincraft, was that the Italian Army suf-

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Winter and white camouflage clothing were well developed in the Austrian Army by 1918. Thus these Austrians were clad to withstand weather atop 11,700-foot Monte Pasquale. Note the edelweiss symbol worn on the left side of the caps.

fered a total of 200,000 non-battle casualties because of mountaineering accidents during the winter of 1916–17. The Central Powers had only 35,000 casualties from the same causes.

A more serious consequence developed when the Germans, exploiting the situation, won a decisive victory at Caporetto. The exploit of an obscure German lieutenant who was in command of a company of Germany's new mountain troops contributed materially to the development and success of the Caporetto offensive. His company captured a dominating ridge which opened the Isonzo Valley to the German-Austro-Hungarian forces. The lieutenant was Erwin Rommel, who was to emerge later as one of Germany's leading exponents of armored warfare and as chief of the *Afrika Korps*.

Although Caporetto marked the high point of German mountain-warfare achievement during World War I, mountain units of the Kaiser's Army also served in the Balkans during von Mackensen's swift campaign against Rumania, and against the Red Army in Finland during von der Glotz's campaign in 1918.

Because of the substantial reduction in the German peacetime military establishment brought about by the Treaty of Versailles, the mountain

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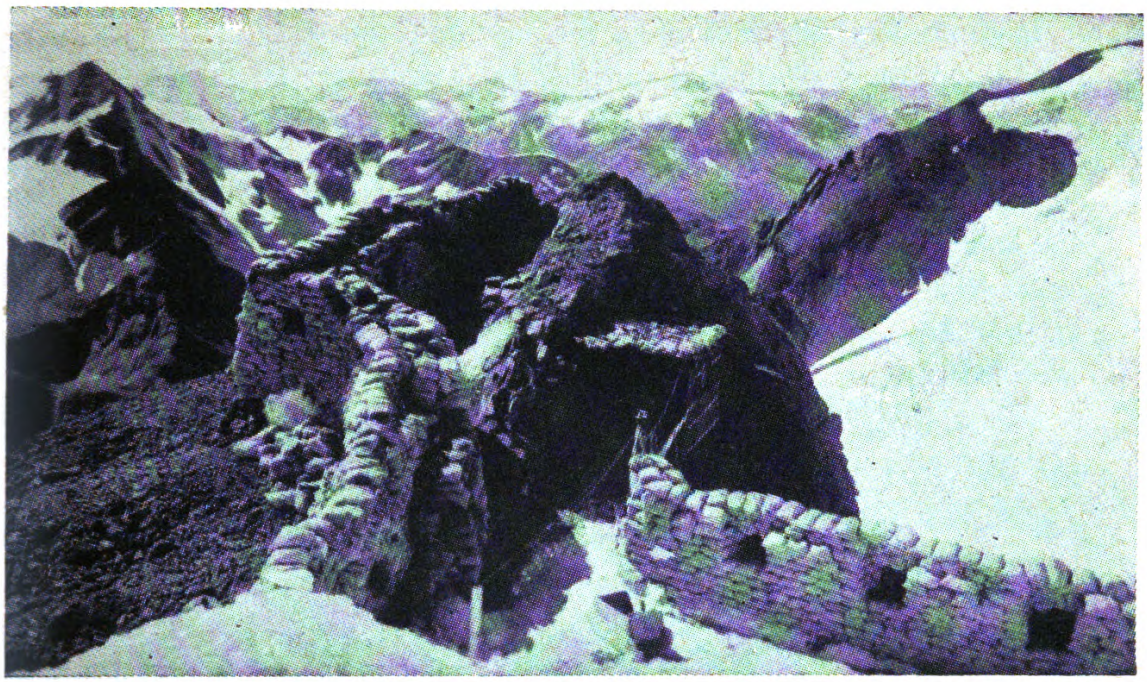


Until the advent of the 75-mm Skoda M15, the 7-cm M99 was the main Austrian mountain artillery piece of World War I, though supplemented by more modern, larger-caliber howitzers. M99 guns still may be encountered in the Balkans.

units of the *Reichswehr,* until 1935, were restricted to one battalion of mountain infantry (*Gebirgsjäger*) assigned to the 19th Infantry, one signal company, one engineer company, and two artillery batteries. All these were components of the 7th Infantry Division at Munich, and were high mountain, or alpine, troops (*Hochgebirgsjäger*) rather than standard mountain troops. The 2d, 4th, 10th, and 17th Infantry Regiments each had a battalion of light infantry (*Jäger*) trained and equipped to fight in low mountains. In the Austrian Army after World War I, great emphasis was placed on mountain troops, the majority of infantry being organized into alpine regiments or battalions. Thus in 1928 the Austrian standing army had 12 infantry regiments, of which 6 were alpine, and 4 independent infantry battalions, all of which were alpine. With the creation of the new German Army in 1935, German mountain units were expanded to comprise one full division. The addition of Austrian organizations after the annexation of Austria in 1938 gave the German Army 3 mountain divisions out of a total of 50 active divisions of all types, including 5 armored divisions.

Recently the German tendency to specialize in the training of mountain troops has become more marked. Several light (*Jäger*) divisions, which

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The techniques of mountain warfare were highly developed on the Italian front during the last war. Positions were fortified with loose rock secured with meshed wire, or (to avoid injuries from flying rock) sandbags, as shown above.

normally bear a resemblance to both mountain and motorized divisions, have been created and adapted to fight in medium mountains.

Mountain units now exist not only in the German Army and the Armed Party Elite Corps (*Waffen-SS*), but also in the Luftwaffe, in the State and the *SS* Police, and even in the Navy. Luftwaffe mountain troops furnish weather, antiaircraft, and air-raid warning services. These Luftwaffe mountain troops include units of the Women's Auxiliary Signal Service (*Luftnachrichtenhelferinnen*), who wear distinctive mountain uniforms. Naval mountaineers provide signal and weather stations, but during the siege of Narvik the survivors of sunken German destroyers were given mountain training and employed against Allied forces as mountain infantry. Police mountain units consist either of the rural division (*Gendarmerie*) of the State Police on duty in German mountain regions, or of special State and *SS* Police (*Polizei* and *SS-Polizei*) organized in independent units for service in countries occupied by the German Armed Forces.

During the present war the number of German mountain divisions has been increased to nine army divisions and four *Waffen-SS* divisions. At the peak of their development, mountain forces of all kinds under German control totaled 21 divisions, not including independent mountain battalions

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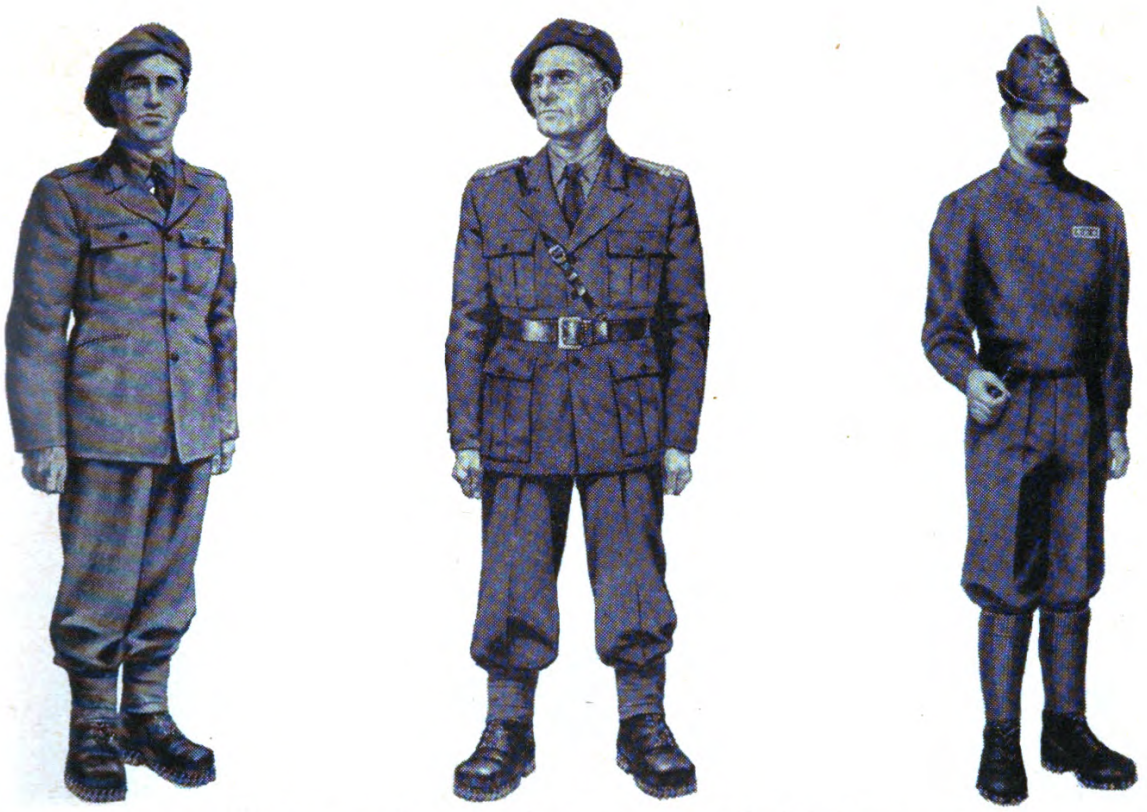
and brigades. This figure includes the mountain units of the satellite Hungarian, Bulgarian, Rumanian, Croatian, and Italian armies. Despite losses in Rumanian, Bugarian, and Italian divisions, Germany still controls mountain forces of a formidable size, and these reflect the experience of a dozen European nations for more than 65 years.

Since 1939 German mountain troops have operated, often decisively, in almost every European mountain region—during the Polish Campaign, in the High Tatra Mountains and across the northern slopes of the Carpathian



Climbing techniques and transport (including aerial tramways) were highly developed by the Austrians by 1918. Above, they haul a gun up a snow slope.

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In this war satellite mountain troops have cooperated with German forces. Illustrated, from left to right, are mountain uniforms of a Rumanian private, a Rumanian colonel, an Italian colonel. German uniforms may be worn instead.

Range; in the mountains of Norway; in the Vosges Mountains of France; and in the Balkans, the Caucasus, Lapland, Tunisia, and the Apennines. The purpose of this book is to present, mainly in graphic form, the various aspects of German mountain-troop training, techniques, weapons, and auxiliary services. The contents of this study emphasize identification of German methods and matériel, and in this respect the book complements "German Mountain Warfare", SPECIAL SERIES, No. 21 (29 February 1944).

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These riflemen of the *Waffen-SS* Bosnian-Herzegovinian Mountain Division appear in characteristic fezzes and the new army coat with pleatless pockets.

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UNIFORMS AND INSIGNIA

UNIFORMS

The German Army, Luftwaffe, and Armed Party Elite Corps (*Waffen-SS*) all furnish their mountain troops with special clothing to meet the peculiar climatic conditions and lack of shelter in mountains.

The gray-green army mountain uniform is derived from Austrian uniforms developed during 1914–18. At first it included tight trousers and leather knee pads (see p. 128), but since the introduction of the present army uniforms in 1936 the mountain uniform has been modified only by addition of insignia. It has thus remained unchanged through 3 years of peace and more than 5 of war.

Waffen-SS mountaineers may wear army clothing, but often their dress includes the roll-collar *SS* coat and the reversible windproof pull-over of mottled camouflage material (p. 52).

Luftwaffe mountaineers pattern their gray-blue uniform on types worn by other Luftwaffe personnel. Their special clothing includes mountain cap, ankle-wrap puttees, and ski-mountain boots.

Mountain State Police (*Polizei* and *Gendarmerie*) are clothed like army mountaineers, but usually wear a *Polizei* coat.

Besides the ordinary mountain uniform, army mountaineers receive extra clothing. These items include new heavy winter reversible uniforms, white surcoats and coveralls (often worn by patrols), and heavy white sheepskin coats. Since the sheepskin coats are too bulky to be practical except for sentries and gun crews, the reversible winter uniforms are generally worn by most personnel. Made of material consisting of two layers of wind-

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The army mountain uniform is almost identical for officers and men.



Different cloth and insignia are used in *SS* mountain uniforms.



For mountain duty, Luftwaffe men add cap, puttees, mountain boots.

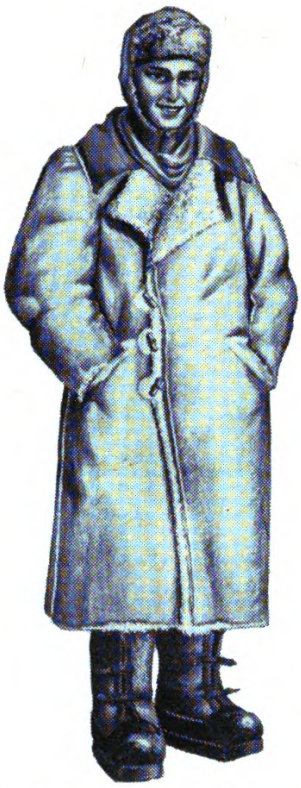
resistant, water-repellent rayon with a middle layer of a wool-rayon fabric, the uniform consists of trousers, a hooded parka with waist drawstring, reversible mittens, and special boots. The boots have four-layer walls so that they can be stuffed with straw to give extra warmth and absorb moisture. Soles are in eight layers. The boots, being made of canvas, are unsuitable for mud and wet snow. Regular trousers and a turtle-neck sweater, or padded trousers and jacket, are worn under the uniform. The steel helmet fits under the parka hood and over a wool-rayon toque. Wool-lined canvas face masks furnish protection against wind. The white side of the uniform is worn in complete snow; the other side, which may be gray-green or mottled, in terrain with patchy snow.

Before the war, parkas were issued to army mountaineers on the basis of 10 percent of unit strength. Rubberized overcoats for motorcyclists and truck drivers, and jackboots for engineers, are other examples of deviations from standard army mountain clothing. As of 1941, mountain supply trains, veterinary companies, and mountain military police (*Feldgendarmerie*) companies were not outfitted as mountain troops.

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The windjacket of windproof olive calico is used by army personnel.



The heavy sheepskin overcoat is used for sentries by army and Luftwaffe.



New winter uniforms are worn by all branches of the German Armed Forces.

The clothing issued to the mountain infantryman is as follows:

1 mountain cap
1 mountain cap cover (white)
1 field coat*
1 leather coat belt*
1 windjacket
1 twill fatigue coat*
1 pair of twill fatigue trousers*
1 pair of mountain trousers
1 overcoat* (in winter only)
2 field-gray shirts (with two breast pockets)
2 pairs of underdrawers*
1 pair of service shoes*
1 pair of suspenders
1 special sweater
1 pair of canvas overmittens
1 muffler
1 pair of knitted wool gloves*
3 pairs of socks or footcloths*
1 set of ankle-wrap puttees
1 pair of ski-mountain boots
1 pair of rock-climbing shoes (issued when needed)
1 steel helmet

Items marked with an asterisk (*) denote those which are standard issue for all army troops. It is believed that a pair of standard high walking shoes is not furnished each mountaineer.

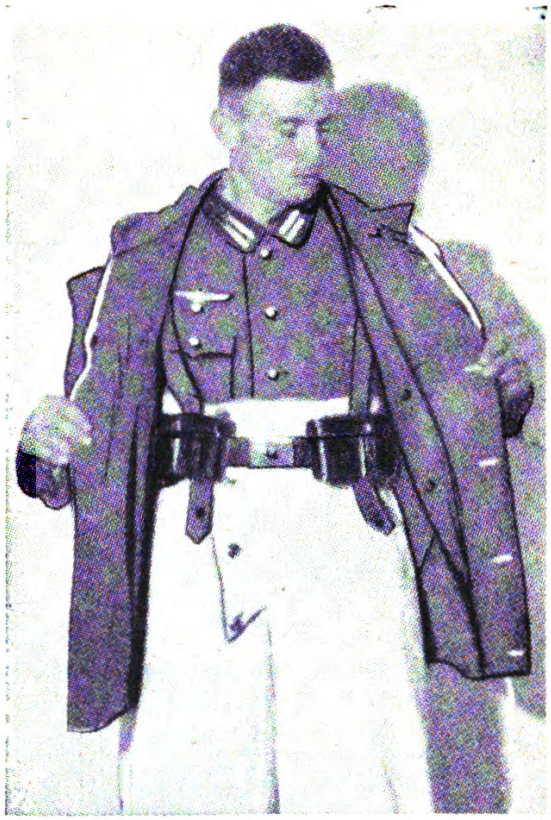
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The new windproof rayon parka has a white side (left), and a tan side (right). Three fibers are used, two for strength, and a third to aid a water-repellent finish by swelling when wet. Ventilation is restored as the fibers dry.

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The new winter uniform displays several novel features. The top-left photo shows the top of the complete uniform. The gloves are secured by a cord running around the neck. The sleeves carry identification bands in the color of the day. For camouflage and improved upper body ventilation, the service belt and ammunition pouches are worn under the coat (see upper right). They hang on the trouser suspenders, and are reached through the coat pockets, where additional ammunition is carried. The photograph at right shows the flyfront of the coat. This construction is designed for windproofing. Note the hood and waist drawstrings, and the appearance of the coat (above) when these and the camouflaged coat belt are drawn tight and knotted.



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INSIGNIA

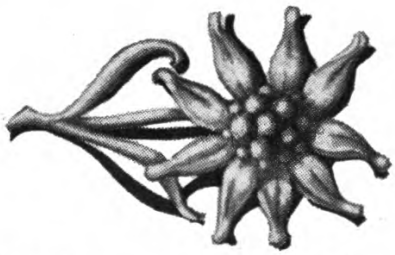
Each branch of the German Armed Forces has a distinctive national emblem based on the Prussian eagle (see bottom of page). Edelweiss badges are now sometimes worn by Police and *SS* troops. Lefthand *SS* collar patches bear an indication of rank; Police collar patches have a background of light green, orange, or wine-red. *SS* troops wear arm bands on the lower left sleeves of coats and overcoats. Bands of two of the *Waffen-SS* mountain divisions are shown.



Army mountaineer badge, worn on the right sleeve of coats and overcoats.



Army *Jäger* troop badge which is always right sleeve of coats and overcoats.



This is an army mountaineer's badge, worn on the left side of his cap.



Army *Jäger* troop badge which is always worn on the left side of cap.



Army-Navy eagle (national emblem), worn on the right breast of coats.



Luftwaffe eagle (national emblem), worn on the right breast of coats.



SS eagle (national emblem), worn on left sleeve of coats and overcoats.

Police eagle (national emblem), worn on the left sleeve of coats and overcoats.



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Right-hand collar patch worn by the personnel of *SS*, except generals.



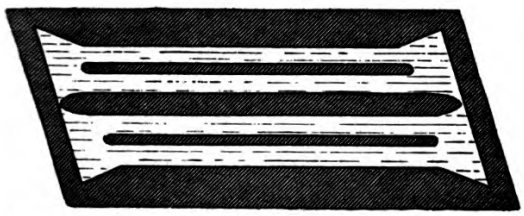
Right-hand collar patch worn by all personnel of *SS* Death's Head units.



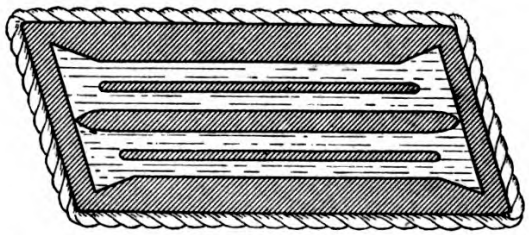
Right-hand collar patch for *SS* Bosnian-Herzegovinian Mountain Division.



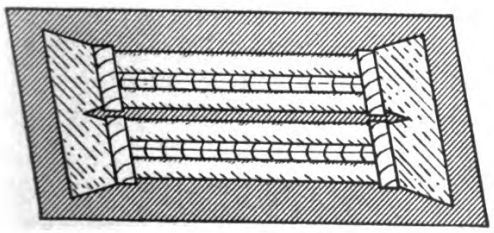
Right-hand collar patch for personnel of *SS* Prinz Eugen Mountain Division.



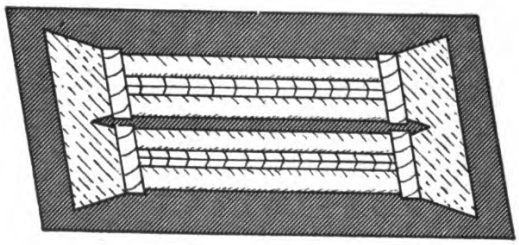
Most common collar patch for army enlisted men, sometimes worn by officers.



Collar patch for State Police enlisted personnel (green or orange background).



Collar patch for army field and company officers. Generals wear oak leaves.



State Police collar patch, field and company officers (green or orange).

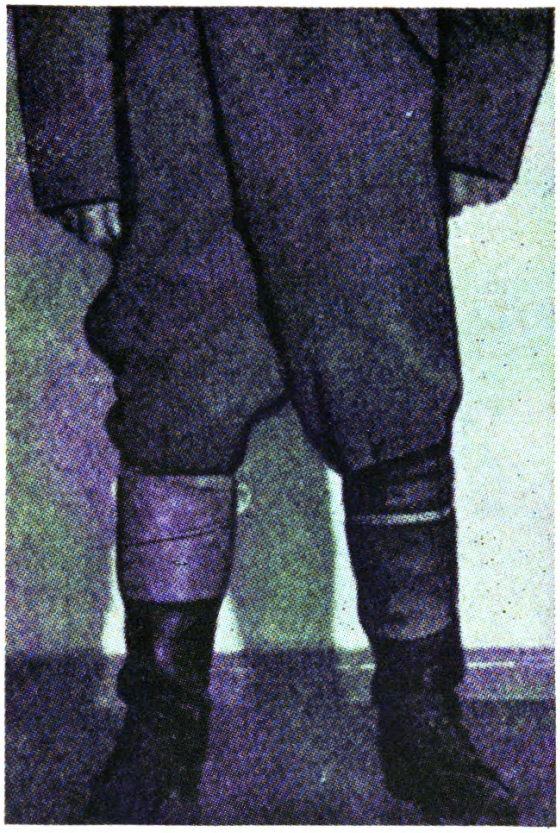


Left sleeve arm band for coats, overcoats of *SS* Mountain Division Nord.

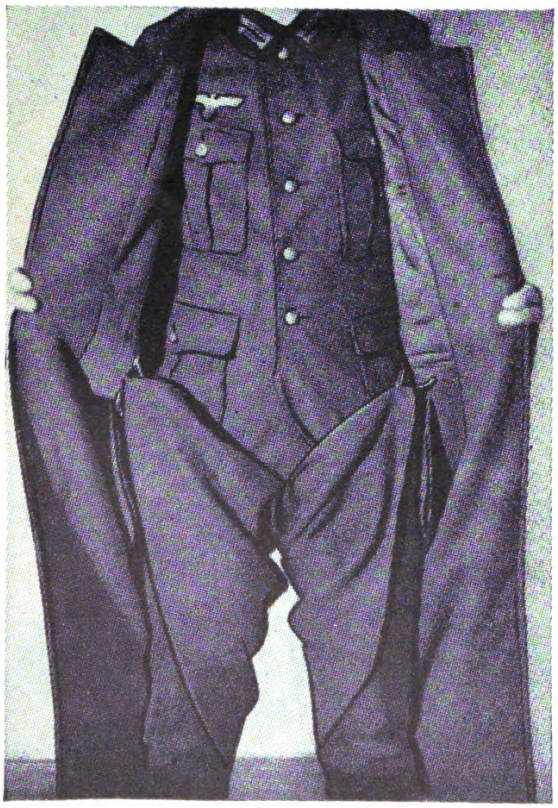


Left sleeve arm band, overcoats and coats, *SS* Mountain Division Prinz Eugen.

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The ordinary German overcoat may be arranged to provide improved protection in snow and cold. Above are front and rear views of a modification approved by the German quartermasters. Note the cloth wraps tied about the leather boot tops. The detailed view at the left shows how the modification was made. Loops are sewn inside the overcoat. The ends of the back fly of the overcoat are then brought up between the legs and secured through the loops. The bottom of the coat is then wrapped around the legs and made secure and windproof with cloth wraps, as is shown in the photographs above.

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Hungarian mountaineers may be mistaken for Germans. However, the German-cut coat is khaki, and has collar patches pointed at the rear. The patches bear gold stars to indicate officers, silver to indicate NCO and enlisted grades. The edelweiss (see at right) has no stem. The cap button is red, white, and green. The officers above direct a battery of M15 Skoda mountain guns in the Carpathians.



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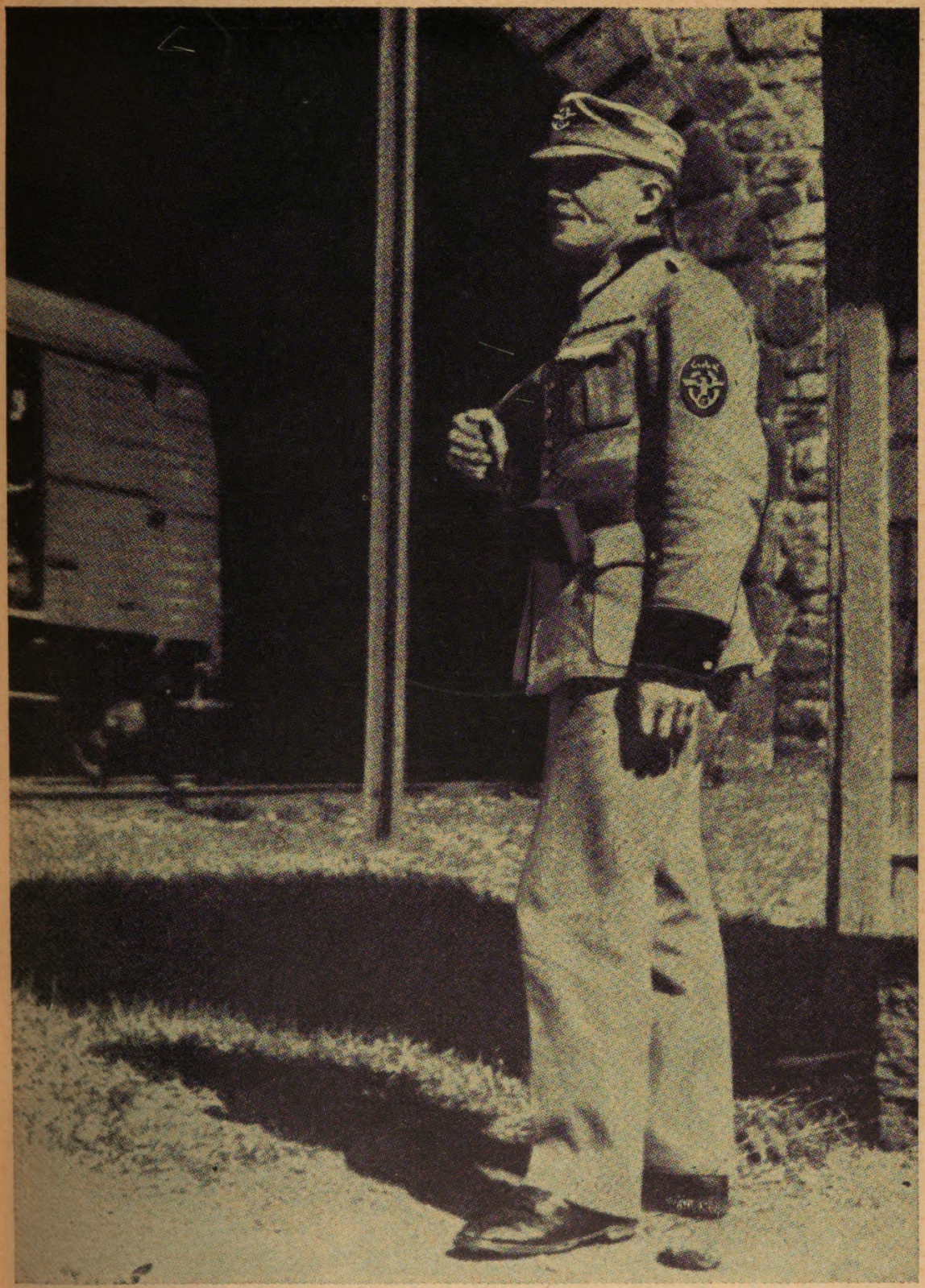


Before the war, light, hooded surcoats were issued to mountaineers for snow camouflage. Coveralls have since tended to supplant surcoats in all units.



Light reversible parkas were also issued before the war. Newest parkas are longer, have three pockets across the breast, but no eagle (pp. 14 and 160).

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Mountain police wear *Polizei* coats with colored cuffs and decorative double fly at back, both bearing gold buttons. Reservist above wears long trousers.

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TRAINING

Since requirements for recruits are kept at a high level, German mountain troops constitute a select corps. In peacetime mountain service was very popular in Germany. Despite the dangers of mountaineering, the number of applicants for this duty was large. The accepted recruits came mostly from the mountain regions of Bavaria and Austria, where the rugged outdoor



A mountain sergeant gives orientation instruction to a Hitler Youth member, who uses a compass. (Other photos of youth training are on pp. 46, 162.)

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Ski troops in Italy are the best trained of German mountain troops today. They are skilled in all phases of mountain warfare. Those above march with their pack mules in the mountainous Abruzzi province of central Italy.

life and mountaineering tradition of the people produced candidates who were ideally qualified for service in mountain units.

Despite a relaxation of standards because of casualties and an increase in the number of mountain divisions, till mid-1944 the Germans stressed premilitary training of youths for mountain service. Until then there had been no change in the policy of assigning experienced noncommissioned-officer mountaineers as instructors to the Hitler Youth, an organization of boys 14 to 18. Boys selected for preparatory mountain training were natives of mountain country or of cities like Munich, from which mountains are easily accessible. This training was continued when the youths entered the Labor Corps (*Reichsarbeitsdienst*). Prior to 1942, youths started their 6 months' compulsory labor service on reaching the age of 18; since then, the entrance age has been lowered, first to 17 and then to 16½ years. In the Labor Corps the training emphasis was shifted from mountaincraft to engineering and supply problems in mountain warfare. The first phase of the preparatory program brought youths to a point of physical development and mountaineering skill which made it possible for them to endure strenuous exertion without danger of permanent ill effects. The secondary

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phase of youth training therefore stressed hard labor connected with the logistics program and gave a subordinate place to orientation, mountain walking, rock-climbing, knowledge of weather, methods of living in mountains, and preparatory body-building suitable for adolescents. Coached by mountain soldiers, Labor Corps men learned to prepare routes, build shelters (see p. 162), construct bridges, and perform similar tasks.

As a result of this preliminary mountain-training program, many candidates accepted for army mountain units had an excellent background in all mountaineering activities, including basic indoctrination in tactical factors.

Recruits now are believed to receive no more mountaineering training than they can absorb during basic infantry training in mountain regions. A small percentage get training in command, combat, and firing problems at the *Gebirgsjägerschule*. At the school's Fulpmes branch (in a region of perpetual ice and snow) selected men train in rock and ice climbing and skiing. However, many men in addition to those receiving special training have a sound knowledge of skiing and mountaineering acquired as civilians.

The most promising of trained mountain soldiers may qualify as guides by further schooling. In prewar times there was normally one guide to three ordinary mountain infantrymen. Guides receive certificates and an edelweiss porcelain badge inscribed *"Heeresbergführer"*. The guides' course is most difficult; even possessors of civilian National Mountain Guide licenses may fail to qualify.

When mountain troops are trained, they participate in more or less standard forms of military contests. In summer such contests usually consist of competitive climbing, walking, running, and firing; in winter, skiing or ice-climbing may be added. Contestants generally are organized in teams of four. Each team must stay together and finish together, and teammates assist each other at all times, especially while climbing. In selecting the winning team, elapsed time is weighed against marksmanship scores made at one or more target ranges along a prescribed route. Because of the self-discipline necessary to control pace and effort in order to avoid fatigue and consequent deterioration of rifle marksmanship, the exhilaration of competition in all forms of mountaineering, and the sense of teamwork that is cultivated, these contests have come to be regarded by German mountain troops as a high point of military life.

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A member of a contest team ropes down during a mountain troop contest in Norway. A team generally consists of an officer, a non-commissioned officer, and two privates. The officer carries a rucksack and extra gear; enlisted men carry rucksacks and M98 rifles.

Every effort is made to make unit contests enjoyable. Soldier spectators assemble at crucial point and cheer. At the end of exciting runs, military bands play to stir up the competitive spirit of contestants. At the left are examples of German humor placed beside the route of a unit contest to make the test more amusing for the troops. The first sign, placed at the end of a difficult run, warns skiers not to go soft; the other warns that the tree is not of rubber.



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Team 47 passes along a level stretch during a contest in north Norway. The four-member team is led by a lieutenant, who appears at the extreme right.



In a winter contest Team 9 fires without removing skis. Absence of caps is not remarkable, and often in battle soldiers wear only their visored caps.

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Team 11 passes victoriously under the finish mark at Garmisch. Note the efforts made to decorate the course and to create the effect of a gala occasion.



In this contest the mountain infantry squad is the team. Here the squad leader receives congratulations for himself and his squad of six riflemen (left).

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Mountain troops are trained to use the valleys for rapid marches. This column is reported to have marched 40 miles a day along this Montenegrin valley road.

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IN THE VALLEY AND IN THE FLAT

Valleys, which in effect are broad, flat corridors, are the ideal routes for an advance through mountains. Even at great altitudes there are valleys with fairly level roads. Plains of considerable extent also are found within mountainous regions.

Indoctrinated to fight decisive battles in the most rugged terrain, German mountain troops nevertheless make every effort to exploit all natural and man-made approaches. They do this independently or in



When in the flat, mountain infantry wear steel helmets, look much like ordinary infantry. This unit is shown after having been flown to Crete (1941).

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cooperation with other types of troops. Moreover, because German mountain troops are organized, equipped, and trained to fight in any kind of trackless country, they have been used in operations in the flat tundra of Lapland, in the marshes of the Kuban, and in the region of lakes, forests, and swamps of Karelia.

German mountain troops are in fact usually superior to ordinary infantry divisions in any terrain as a result of the high standards applied in selecting, training, and conditioning them. However, these mountain troops are not basically organized and equipped to fight efficiently in the valleys and in the flat. Their main mission usually is to secure flanking mountain features in order to dominate valleys and plains and thus facilitate the advance of ordinary troops. In defensive tactics German mountain troops also try to seize heights to carry out flanking or encircling actions in order to obstruct or destroy advancing enemy forces. Offensive valley fighting is facilitated by the flanking action of mountain units and by the capture of superior observation posts on heights. Mountain troops also train, advise, and guide units cooperating with them on lower terrain, and in turn receive supporting fire, when possible, from medium and heavy artillery at lower altitudes. This support may be provided by assault guns and artillery moving along mountain tracks, and by 88-mm and four-barreled 20-mm antiaircraft guns concealed along routes to protect motor supply columns from strafing. Personnel of German interceptor-fighter aircraft employed in mountain operations for aerial combat receive special training designed to adapt them to mountain flying. Personnel of other types of aircraft also receive special training, which is given at the Mountain Aerial Warfare School in the Tirol.

As crack troops, German mountain units are prepared to improvise as the situation may dictate. In Greece they used native sailing craft for supply and flanking movements. They were airborne in the battle for Crete, and were dropped by parachute to support Gen. Dietl's beleaguered forces in Narvik. Their battle experience is most varied; the 1st Mountain Division has fought in Poland, France, the Balkans, southern Russia, and the Caucasus; the 3d Mountain Division has fought in Poland, Norway, Lapland, and southern Russia. In late 1943 and early 1944, when the need for alpine troops diminished in the south Balkans, alpinists were withdrawn from the mountain units there and formed into independent high-mountain battalions (*Hochgebirgsjägerabteilungen*).

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For a rapid movement against Soviet units in the Caucasus, these mountain infantrymen have loaded rucksacks on platoon wagons; carry only arms, ammunition, ponchos, mess and gas-mask cans, entrenching tools, and musette bags.

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Medium field artillery (like these Skoda 150-mm M1930/37 howitzers in action during the Greek Campaign) fires from a valley in support of mountain troops.



Batteries of 105-mm field howitzers may be incorporated in mountain units when they operate in valleys or flat terrain, like this unit shown in south Russia.

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Heavy field artillery often follows German mountain troops if good valley and mountain roads are available. This *21 cm Mrs. 18* is in Bavarian maneuvers.



German mountain units employ heavy artillery when possible to reduce mountain fortifications, like these of the Greeks' Metaxas Line here shown under fire.

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Ordinary infantry, usually stiffened or coached by mountain troops, fights in the valleys in cooperation with mountain troops on the heights. The men above belong to a heavy machine-gun unit preparing to go into action (Norway, 1941).



The mountain motorcycle battalion exploits its mobility for missions that are not possible for motorized infantry. This group of motorcycle infantry is passing through a demolished railway cut during the Greek Campaign of 1941.

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In mountains, tanks usually march and attack in single file, taking concealed firing positions on forward or reverse slopes. Trains are left well behind. These are former French 12-ton H–39 tanks fighting Yugoslav Partisans (1944).



On breaking into a valley, mountain troops are prepared to utilize captured combat or transport vehicles until their own can effect an entrance into the newly-won roads. Here a mountaineer tests a Bren gun carrier (Crete, 1941).

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When fighting in marshes, mountain troops must build positions above ground because of the high water table. Camouflage therefore is difficult. The reed mats above appear to be a standard type of camouflage. This is an 81-mm mortar position in a south Russian swamp. The Germans say that the 81-mm mortar was the heaviest weapon which could be used in this particular terrain.

Being a select and better trained corps than other arms, mountain troops are most versatile. Here they man a captured Greek sailing craft (1941) in order to supplement their supply.

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Assault guns may support the forward elements of mountain troops operating along mountain roads. Mountain engineers here repair the Caucasian road to Tuapse to speed the advance of two *7.5 cm Sturmgeschütze 40* (long 75-mm guns).

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MOUNTAIN WALKING

The Germans believe that walking in mountain terrain requires skill, especially off trails. Their mountain manual teaches evenness and maintained rhythm of pace, deep regular breathing, and use of the whole foot. A zigzag instead of a straight course is used on steep ascents. Frequent halts are considered exhausting, and much talking and smoking bad for the wind.



Mountain infantry ascend a Balkan valley slope. The terraced slope calls for mountain walking; the heights beyond, for rock climbing. Germans move deliberately with planned timing. Needless tiring of troops is carefully avoided.

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This heavy machine-gun unit (with obsolete *M. G. 08*) is practicing the standard mountain file formation. Contrary to German principle, there is insufficient interval between men and between units. Ice axes are used as canes.

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Mountain artillerymen carry ammunition up an Italian mountain (1944). Their abnormally great interval is due to fear of planes. Sufficient interval is usually kept to avoid halts at the rear as the head of a column begins climbing.

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This mountain infantry squad in Italy is almost rock climbing. They are using hands for support and balance only, as in rock climbing. They carry: *M. P. 40* (sgt., at top); *M. G. 42; Kar. 98* and *M. G. 42* belt box; *Gew. 41* and belt box.

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ROCK CLIMBING

EASY CLIMBING

While ordinary German troops may operate in mountains where marches can be made under supervision of trained mountain troops, the German Army permits only experts to engage in rock climbing. Difficult as some of the rock climbing illustrated on these pages may seem, the practice of this art in mountain warfare is believed by the Germans to have great effect upon the outcome of a mountain engagement. Daring troops, taking advantage of the cover afforded by the rugged terrain and the limiting effect of weather on observation, can gain heights without being detected. From heights they may bring surprise fire to bear on points vital to the enemy's supply system, communications, and personnel. Once troops have seized commanding positions in mountain fighting, according to the German doctrine, it is very difficult to dislodge them.

During the war of 1914–18, Italian, German, and Austrian mountain troops displayed great enterprise and ingenuity in alpine operations. In the very rugged Tirol, they performed feats of mountaineering on rock, snow, and ice that have never been equaled in civil mountain climbing. At one point in the Tirolese Alps, the Austrians constructed a mine tunnel almost 4 miles through ice in order to blow an Italian strongpoint off the top of a mountain.

Rock climbing techniques used by the Germans are practically identical with general mountaineering practice throughout the world. Only a selection of the common German techniques are shown on these pages.

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A German lieutenant instructs mountain troops in the first essential of rock climbing: roping up. They are securing climbing ropes about their chests, thereby linking themselves together in roped-up groups, each of three men.



Mountain troops rope up for a practice ascent. The two men at the right are climbing without being roped up. The lower man of the right pair carries a light machine gun (*M. G. 34*); the other soldiers are carrying their rifles.

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This Montenegrin mountain rock face offers fairly simple rock climbing; hand- and foot-holds are being employed. The rope is for safety. The man in the center carries an *M. G. 34;* the other two submachine guns and *M. G. 34* belts.

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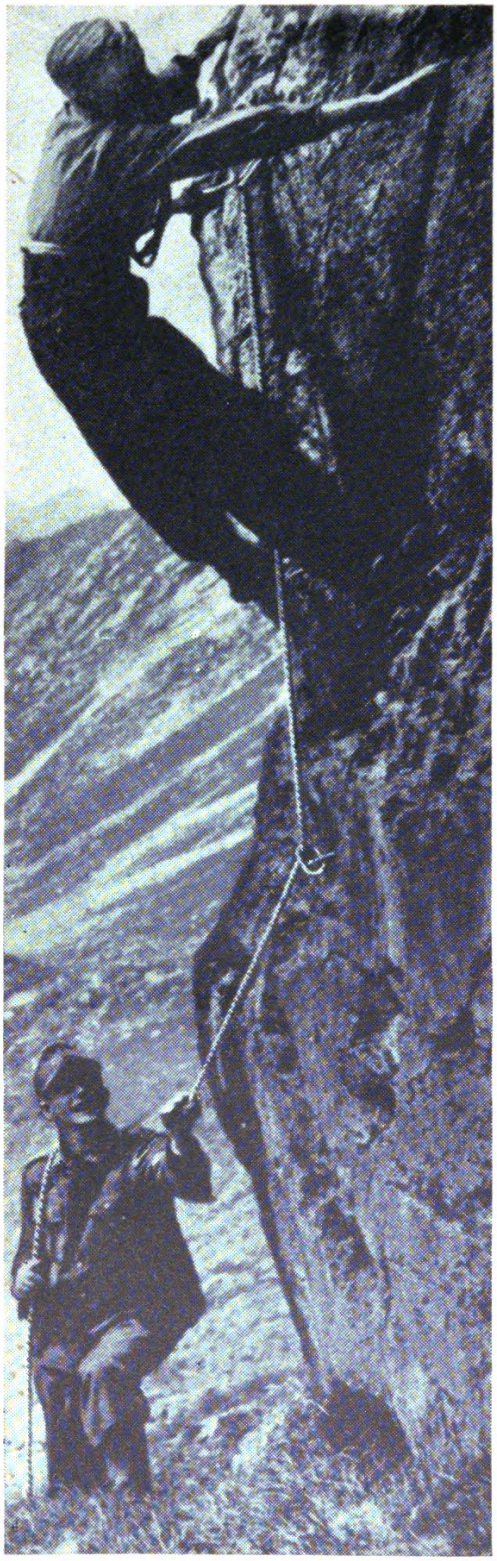


Easy rock climbing is demonstrated by these mountaineers in Bavarian mounta maneuvers. Finding hand- and foot-holds plentiful and secure, they climb witl out roping up. They are carrying rucksacks. Their rifles are slung.

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A Hitler Youth is belayed by a mountain sergeant during training in tension climbing. Note pitons and snaplinks.



To start tension climbing, climber hammers in piton (above), snaps snaplink into piton, rope into snaplink.



Aided by rope and by foot pressure, climber ascends to point at which he can hammer in the next rock piton.



The next piton being hammered in and snaplink snapped into piton, the rope is put into snaplink. Climb continues.

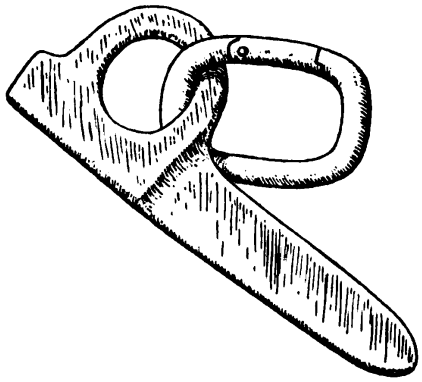
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TENSION CLIMBING

Tension climbing is employed in surmounting overhanging rock walls, or in scaling rock faces devoid of good hand- and foot-holds.

Several types of tension climbing are practiced by German mountain troops. The simplest of these is being taught the Hitler Youth shown climbing an overhanging rock face (see left hand page). Details of this technique are illustrated in the adjoining diagrams. In the first stage, the climber "ropes up" in a normal manner. Next he hammers piton into the rock face, snaps a snaplink into the hole in the end of the piton, and snaps his climbing rope into the snaplink loop. Using the snaplink as a pulley, the man aiding the climber takes up the slack in the climbing rope secured about the climber's waist. With the aid of the rope, and by use of feet and hands, the climber ascends. Doctrine forbids climbing so high at each stage that the pull of the climber's weight on the piton is other than downward. Otherwise, the piton might be pulled out. In the second stage, while sustained by the rope and by the pressure of his feet against the rock, the climber reaches up and drives a second piton. The procedure of attaching snaplink and rope is repeated. Usually the pitons and snaplinks are removed by the last climber for later use.

Ascent by tension climbing is tedious and time-consuming, but the Germans believe that the unexpected appearance of troops on dominating heights affords excellent opportunities for tactical surprises. Time and effort spent in tension climbing thus are deemed more than balanced by possible results.



German mountaineers use both rock and ice pitons.
Above is a common army rock piton with snaplink.

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BILGERI METHOD OF ASCENDING

Once the tension climber has reached the shelf or height which has been his objective, he can easily bring up the rest of his party by the Bilgeri method of ascent, provided that the shelf overhangs.



Climber ropes up with waist and shoulder loops. Both are secured at the same knot. The rest of the rope is free. Man on shelf sends down his rope to bring up loose end.



Climber ties a foot loop in the free end of his rope. This loop is run inside the waist loop and is put over foot. The free end of rope is now brought up by man on shelf.



The rope which took the climber's rope to the shelf is sent down again. A foot loop is made in the end of this rope, and this loop is also run through the climber's waist loop.

The Bilgeri method is explained in the accompanying diagrams. The "climber" is the next man to follow the tension climber. Ropes are run through the waist loop in order to keep them close to the climber's body, although he grasps them to secure support. When two or more men have joined the original tension climber on the shelf, belaying the foot-loop ropes becomes a fast and simple matter, so that other climbers can follow rapidly. Arms and ammunition may then be hauled up with facility.

When operating on glaciers, roped-up groups find the Bilgeri method of ascending most useful in effecting rescue when a member of a group happens to fall into a concealed crevasse.

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With ropes adjusted, the climber raises first one foot and then the other. The man on the shelf alternately takes in slack and belays the two ropes, permitting the climber to use the two foot loops as steps. Belaying is usually effected by using the body or a rock.

SS mountaineers assist a man who has just completed an ascent by the Bilgeri method. Note the rope stirrups, the full rucksack, and the slung machine gun.

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From the summit of this rocky Montenegrin ridge in Yugoslavia, these troops are in a position to fire into the valley below. Germans believe that rock climbing to vantage points makes possible very effective tactical surprises.

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TRAVERSING

Often in rock climbing it is necessary to proceed horizontally. In so doing, gorges, smooth rock walls, or overhanging rock faces may be encountered. Frequently the most rapid and practical method of crossing such obstacles is traversing by the method shown below.

In this process, a climber ascends to a point above that at which he intends to make his crossing. Here he secures his rope. He may also have his rope belayed by a member of his rope group. Descending to the crossing point, he swings out across the difficult area, pendulum fashion. Suspended on his rope, he pushes against the rock face in order to get over to a secure shelf or hold on the other side. Once arrived there, the climber belays himself and prepares to receive others. In general, the most skilled man will go first. The least skilled will go second so that he may be belayed and assisted by more experienced men at both ends of his traverse.



A mountaineer practices traversing across an overhanging rock face. By crossing apparently impassable areas in this manner, mountain troops may effect surprises against forces not acquainted with rock climbing techniques.

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BELAYING AND ROPING DOWN

To "belay a rope" is to secure it, either by having another climber snub the rope with his body, or by securing it on a projecting rock, a piton, or any other fixed object. In roping down, the last man may place a small rope loop over a rock. Through this he will run his rope, and then descend on this doubled rope, so that he can retrieve it by pulling one end through the loop.

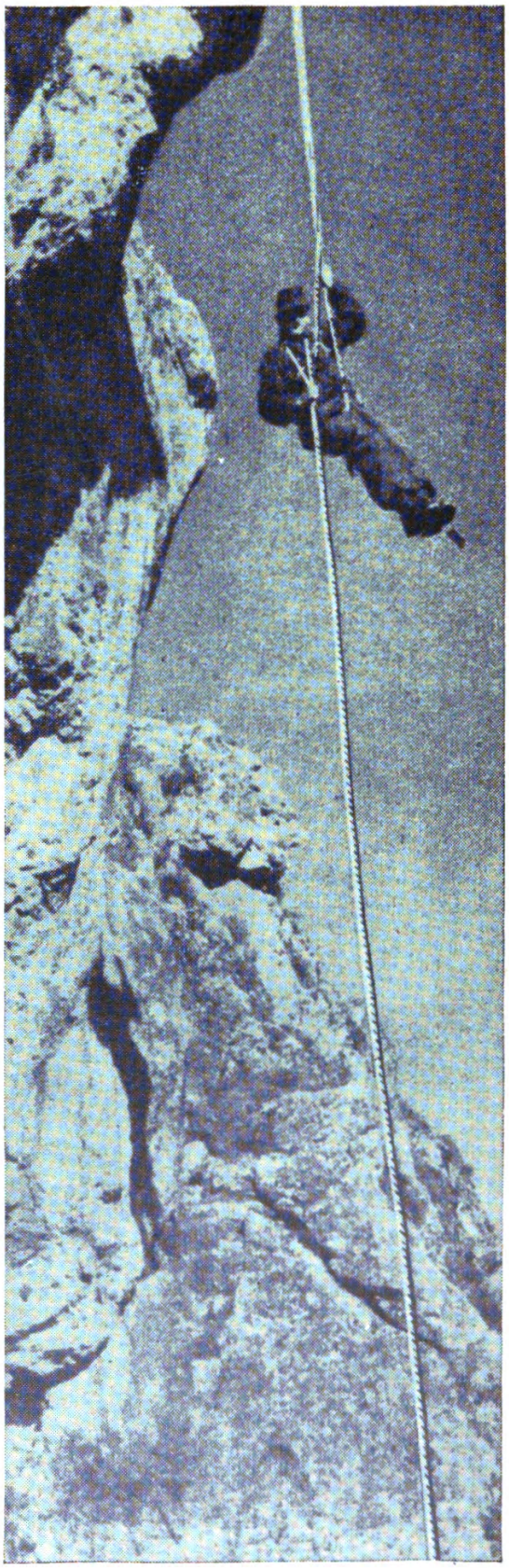


An *SS* mountain soldier belays another. The lower man is climbing; the upper man holds the rope so that his companion will not fall if he slips. Since they cannot often be helped thus, lead men on ropes are usually skilled.

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An army mountain sergeant ropes down a rock face. Rope is controlled by his right hand, and is snubbed around his body. There are various methods of snubbing rope around the climber.



This *SS* man is roping down as the first of his group. Note that a safety rope is secured around his chest. This is being belayed by a member of his rope team atop the cliff. He is snubbing it around his body in one of several methods.

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ICE CLIMBING

Snow and ice climbing, like rock climbing, is practiced in the German Army only by qualified experts. The Germans believe that climbing on snow and ice surfaces demands not only thorough training in techniques, but also a good knowledge of the nature and dangers of snow, ice formations, and névé. (Névé is granular snow, an intermediate element between snow and ice.)



SS mountain troops in training at the German High Mountain School are roped up in groups of threes to practice climbing in typical alpine snow and ice.

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Roped up in threes, German mountain-troops cross a Caucasian glacier.



A rope leader (foreground) is stumbling into a snow-covered crevasse.

Climbing on snow and ice is similar in many respects to mountain walking on steep slopes, except that ice and snow often can be ascended best by climbing straight up rather than zigzag. Névé and ice are climbed with a short step. Footholds are kicked in or chopped for each step. On downhill névé and snow slopes, troops may glissadé (slide) if the slope is free from obstacles and not too steep. Normal descents are made straight down if steps are kicked in ice or snow, and by a zigzag course when steps are cut. Crampons (see p. 57) often are used for a better grip. They permit quiet climbing without cutting steps. The ice ax is used to cut steps, to maintain balance, and to test snow bridges. It also is used as a brake in glissading, as a handhold to drive into snow, as a belaying point when fixed in ice or snow, and as a general handy tool. Climbing ropes are essential, especially if mountain troops are crossing glaciers where the dangers of snow-hidden crevasses are considerable.

Fully 20 percent of the German alpine manual is devoted to avalanches, and German doctrine stresses that the danger of avalanches makes operations in snow and ice more hazardous than other mountain activities.

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The leader of a rope group crosses a Caucasian glacial snow bridge. He tests with his ice ax. The second man belays the rope with another ax.

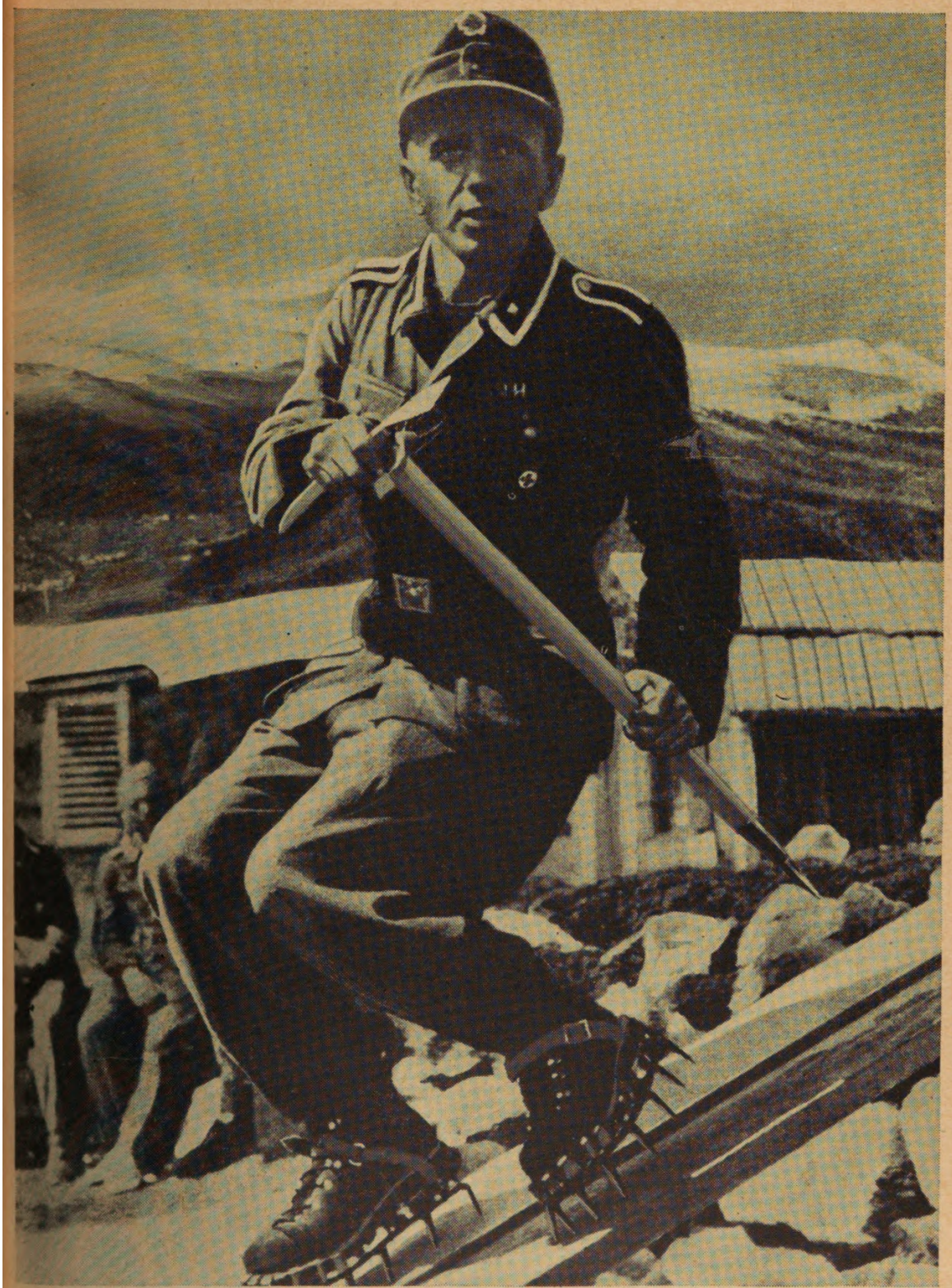


This man uses an ice ax as cane while kicking steps in snow slope with his boots.



German snowshoes are small. A canvas strap protects the shoe from boot hobnails.

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An *SS* mountain sergeant teaches the use of ice ax and crampons during a simulated descent of an ice slope. Planks are used to approximate the angle of the slope. Crampons are strapped on the ordinary army ski-mountain boots.

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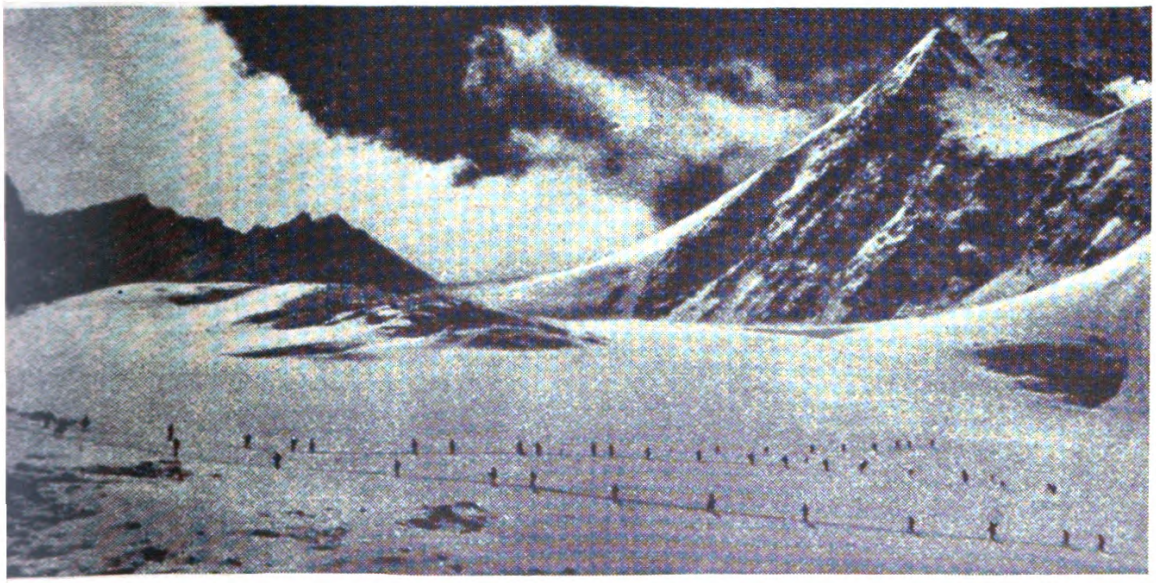
Skiing in mountains is far more difficult than skiing in flat terrain. Here a roped-up group of skiers crosses a high ridge of a snow-covered glacier.

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SKIING

Ski troops are the "cavalry" of German mountain warfare. They try to achieve surprise through speed and mobility. When deep snow hampers the operations of ordinary mountain troops, ski units can continue all forms of combat activity.

Although the number of army-trained skiers is generally about 25 percent of unit strength in German mountain units, the percentage of skiers can be increased quickly because many mountain soldiers had skiing experience in civil life. Inexperienced troops are trained to ski in 6 weeks in army mountain schools.



On open slopes, German ski troops spread out and approach covered positions as rapidly as possible. Downhill, skiers may advance singly or in groups.

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The march formation along tracks or trails is single file, although Germans stress that it has disadvantages, especially in slowing up deployment.

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Ski troops sometimes use the Kandahar ski binding with both front throw and heel lever for tightness. Ski poles are of bamboo. Note the mountain caps.

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A mountain infantryman demonstrates the prone firing position, using his rucksack as a rest and for protection not afforded by light snow. A skier, he made his approach on skis, and changed to snowshoes for the assault.



The *Schiessbecher,* or grenade discharger, has a sighting device, seen just over the man's left thumb, above. This picture shows the large antitank grenade, the maximum diameter of which is greater than the discharger's diameter.

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WEAPONS

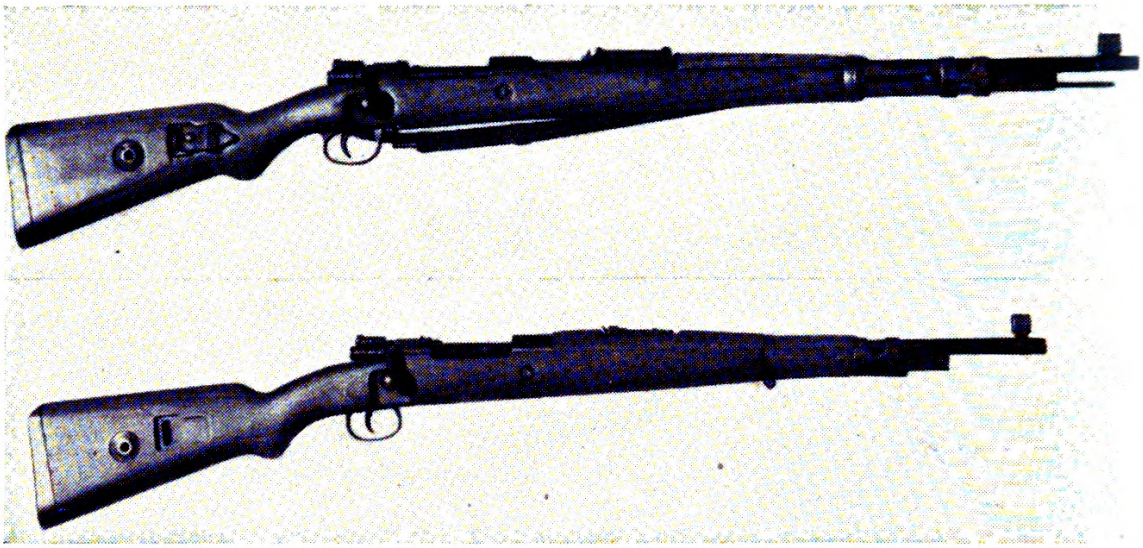
RIFLES

Mobility of weapons being most important in mountain warfare, more attention is paid to rifle training in mountain units than in other branches of the German Army. The standard army rifle *Kar. 98K,* marked *Mod 98* on the receiver, is the commonest mountain arm, but *Gew 41* and *43* semiautomatics, *G33/40* rifles, and Czech Mausers similar to the *Kar. 98K* are also found in mountain units and in the *SS.* Sometimes the *G33/40* has a folding stock.

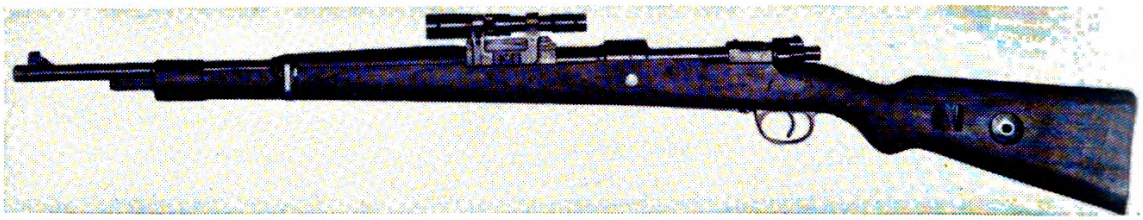
Each infantry squad has a man with a rifle equipped with a telescopic sight. His mission is to outflank enemy groups and pick off unit commanders and machine-gunners. He also acts as a scout in reconnoitering enemy positions. A feature of the telescope *Z. F. 41* (p. 64) is its long eye relief (16¾ inches from eye to eyepiece) which permits ready transfer of vision from the normal to the scope. However, the Germans regard the *Z. F. 41* as an aid to good shots only at medium ranges. They do not believe that scopes make good riflemen out of bad, and discourage the issue of scopes to poor marksmen. With mount bases set to the left of the path of vision for iron sights, both the *Z. F. 41* and *Z. F. 39* scopes permit use of iron sights and the bayonet in close combat.

Also issued to each squad is a cup-type grenade discharger which fires high-explosive, antipersonnel, and hollow-charge antitank grenades. Grenade dischargers, easily attached to the M98 rifle, may also be fitted to an adapted antitank rifle called the *Granatbüchse 39.* These developments are intended to replace the M39 antitank rifle itself, since the M39's 7.9-mm bullet is ineffective against tanks now in general use.

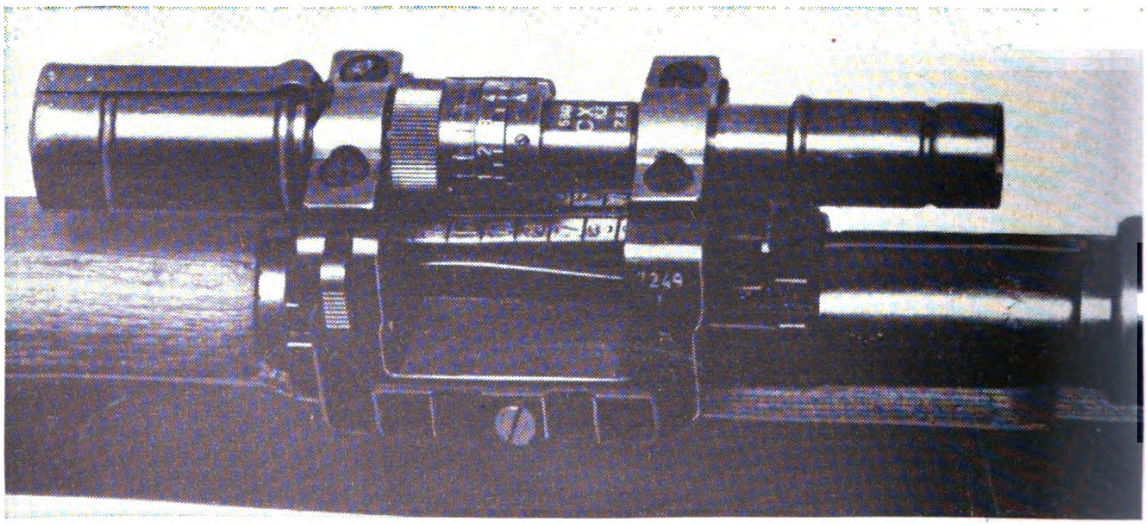
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The former Czech short police rifle (bottom), now made as the German *G33/40*, is issued to mountain troops. Most are still armed with the longer M98 (top).



Most snipers receive a modified M98 rifle designated *Kar. 98K Z. F.* A telescopic sight is fitted and the hood over the foresight removed.



The most common scope is the 1.5 power, 6¼-inch long *Z. F. 41.* Mount and scope are detachable, weigh 13¼ ounces. Vision over iron sights is possible if the glass fogs. This picture is a detail of the scope mounted on the rifle above.

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This mountain trooper in Norway has a Zeiss receiver-mounted *Z. F. 39* scope on his *Kar. 98K Z. F. Z. F. 39's* are issued to crack snipers; the *Z. F. 41* (sighted to 800 yards) reportedly has too many lenses to be effective in poor light.

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SEMIAUTOMATIC, AUTOMATIC, AND HEAVY WEAPONS

German policy concerning weapons has been, in general, to lessen their weight by reducing gun-tube safety factors and by using light metals. With respect to support weapons for mountain troops, the Germans have been able to obtain mobility and compactness by modifying standard types and by specially designing some weapons that are light and easily manhandled.

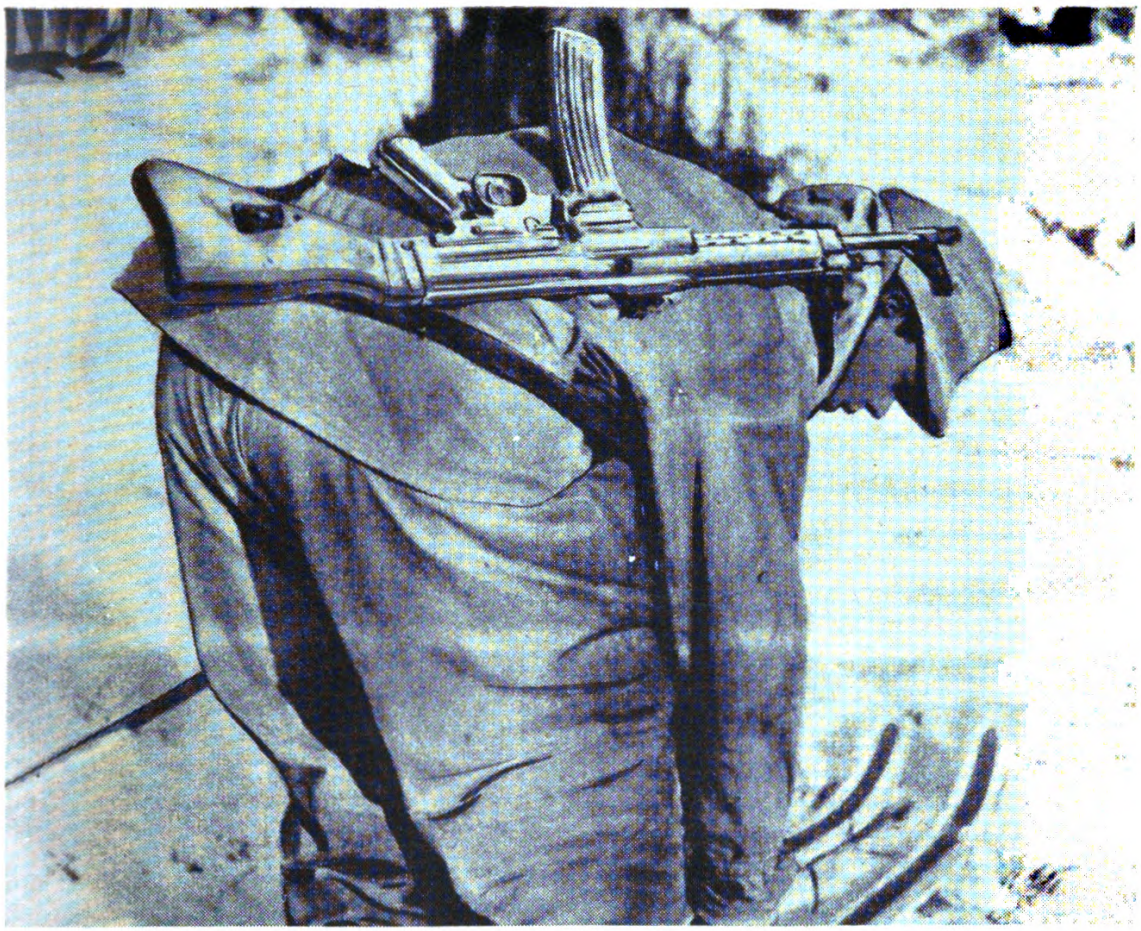
The adaptability of German air-cooled machine guns, which are convertible into light machine guns by substitution of a bipod for the standard tripod, makes them well suited for mountain warfare. Both the *M. G. 34* (26 pounds as a light weapon, and 68 as a heavy), and the still lighter *M. G. 42* represent considerable improvements over the old water-cooled 40-pound light *M. G. 08/15* and the 123-pound heavy *M. G. 08* (the *M. G. 08* is shown packed on p. 39).

In employing automatic weapons, the Germans try to establish enfilading positions whenever possible, but cover gaps with frontal fire. Frontal and enfilading positions are disposed in height as well as in depth to produce a rectangular box of fire.

Since rugged terrain frequently restricts the possibility of grazing fire, the Germans believe that their new machine guns with high rates of cyclic fire are well suited to mountain warfare. The high cyclic rate may result in a larger beaten zone, but the Germans follow the principle that short bursts at high rates actually produce in a few seconds a greater density of fire on all parts of the beaten zone than slower, but more accurate weapons. The Germans have stated that intensive fire of this kind has greater destructive effect, and, in the mountains, where differences in altitude make accurate laying difficult, permits better observation and adjustment of fire.

Croat, Rumanian, and (in the Balkans) German mountain troops have employed many Czech-made *Z. B.* 7.92-mm machine guns captured from other armies. The light *Z. B.'s* (Pragas) are the practically identical *M. G. 26* (*t*) and *30* (*t*), and fire from 20-round magazines at rates of 600 and 800 rounds per minute, respectively. The design of the British Bren gun is based on the gas-operated *Z. B.'s*, which have bipods and flanged air-cooled barrels. The heavy Czech Besa 7.92-mm *M. G. 37* (*t*) has a tripod. Also air-cooled and gas-operated, the M37 weighs 142 pounds and fires from belts at a rate of from 520 to 820 rounds per minute.

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The *M. P. 44* (shown on a member of a ski patrol) fires special 7.92-mm rounds at a semi-automatic rate of 25 rounds per minute. Full automatic fire in 2- to 3-round bursts is reserved for emergencies and in-fighting.



Shown above are three types of German semi-automatic rifles (top to bottom): *Gewehr 41M, Gewehr 41W,* and the new *Karbiner* (ex-*Gewehr*) *43*. Both the *Kar. 43* and the *Gew. 41M* may have telescopic sights. All have ten-round magazines.

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A light machine gunner demonstrates the beaten zone of the *M. G. 34* by firing a burst of tracers against a mountain side. Bursts consist of 7 to 10 rounds.



Croatian satellites and *SS* mountaineers in the Balkans often use Czech *Z. B.* light machine guns. This weapon has a lower rate of fire than *M. G. 34.*

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In World War I the Germans found that troops assaulting high positions in the Tirol could carry nothing heavier than pistols and grenades. During the present war they have selected the *M. P. 40* 10-pound submachine gun, with its light-weight ammunition, as the most effective hand weapon which a soldier can employ in extremely rugged terrain. Ordinarily the squad leader is armed with this weapon, while the squad is armed with rifles, but when loads must be kept to a minimum every man may carry the submachine gun.

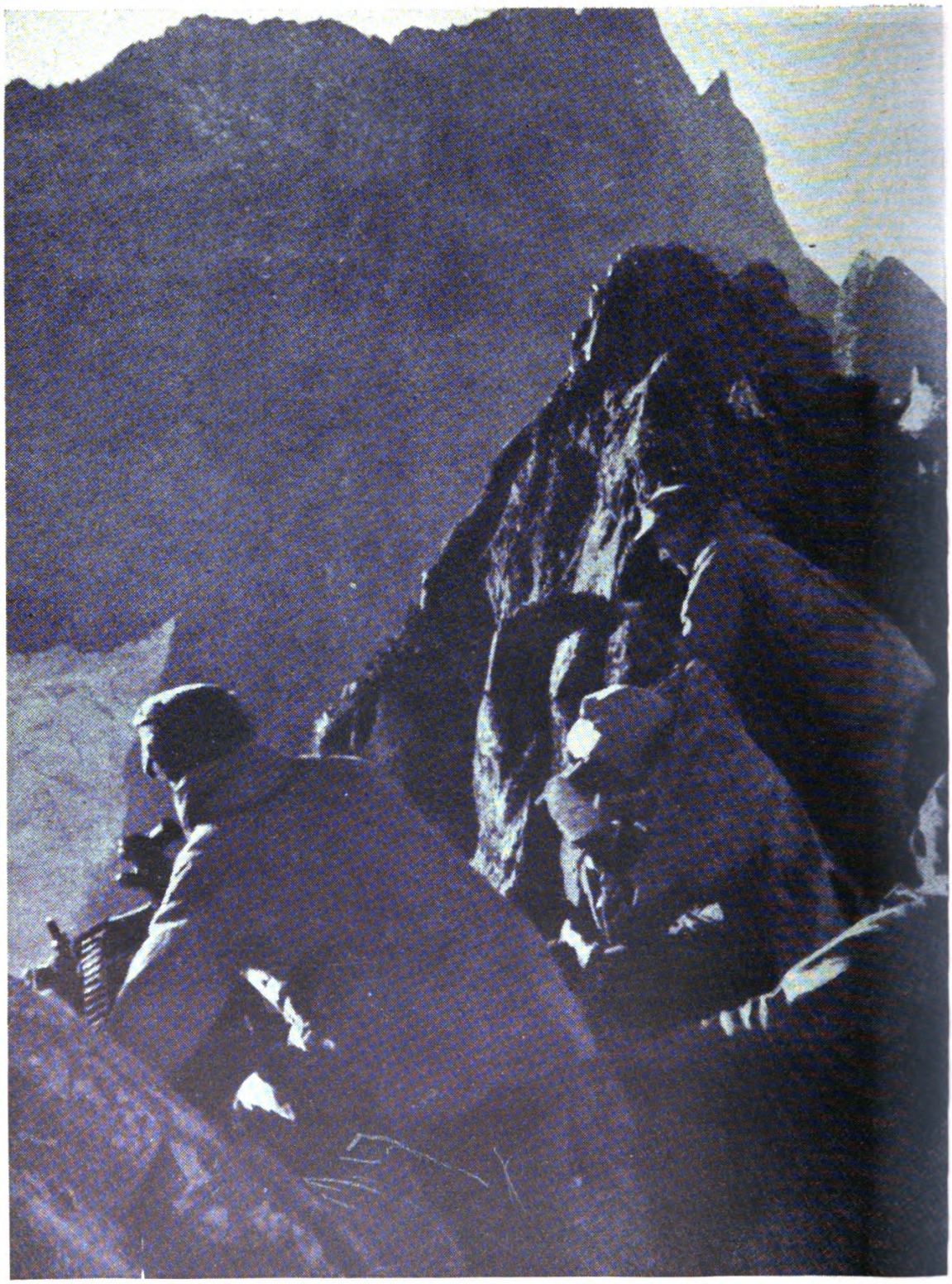
The recently issued machine carbine *M. P. 44* (formerly *43*) may be used by mountaineers. It is accurate to 500 yards. Heavier than the *M. P. 40* and lacking the *40's* folding stock, the *M. P. 44* is a less handy weapon.

German mountain troops use the standard 50-mm and 81-mm infantry mortars. Also available are the Russian Model 1937 and 1941 82-mm mortars, which may be packed. (Model 1937 mortars for mountain use employ a small rectangular baseplate.) These 127-pound weapons fire a 7.3-pound projectile 3,400 yards. Germans also use the Russian M1938 107-mm mountain mortar. The 107-mm and the Russian M1938 120-mm mortar (the German *12 cm Granatwerfer 42* is a copy of the latter) can be packed, the 107 breaking down into 9 loads. The 107 and the 120 look alike. Each has a circular baseplate to which a two-wheeled axle can be quickly attached for manhandling, towing, or animal traction, without breaking the mortars down into component parts. The 107 fires a 17½-pound projectile 6,700 yards, while the 120's fire a 35-pound projectile 6,632 yards. These mortars therefore provide, in the mountains, the type of support the 105-mm field howitzers provide in the flat.

The mountain infantry gun is the *7.5 cm le. Geb. I. G. 18,* a light, split-trailed version of the standard *le. I. G. 18.* Special 75-mm ammunition cases and a special fuze are issued for mountain units; sometimes the 150-mm infantry howitzer supplements the 75's.

Usually 50-mm *Pak 38* AT guns constitute the main antitank armament of mountain units, but the Germans also use tapered-bore guns, which are light and have high velocity for maximum penetration at short ranges. The 75-mm *Pak 40* and obsolete or captured weapons are often encountered in German mountain units. It is believed that extensive use will be made of recoilless weapons: the 88-mm German bazooka, range 270 yards; and the three *Panzerfäuste* (*Panzerfaust Kl. 30,* range 33 yards; *Panzerfaust 30,* 33 yards; *Panzerfaust 60,* 88 yards). The *Panzerfäuste* penetrate over 6 inches of armor.

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This heavy *M. G. 34* emplacement atop a rock ridge in the Caucasus illustrates what the Germans consider to be typical mountain small-arms fire problems. Note the extreme angle of depression. The gun may be seen at extreme left.

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Mountain infantrymen wearing the new parka fire an *M. G. 42*. The legs of the bipod rest on ski-pole rings that keep them from sinking in mud or snow.



When climbs are difficult, machine guns may be roped up. The *M. G. 34* (above) and *M. G. 42* both have tripods with telescopic sights (see picture at left). Tripods are roped up separately. Note that gun is kept well clear of rocks.

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For AA protection of infantry on the march, the heavy machine guns of a heavy weapons unit may be mounted in pairs on the *M. G. Doppelwagen 36* (above). The tripods are carried strapped to the rear.



Germans in Italy have used the Russian M1938 107-mm mountain mortar *(10.7 cm Geb. Gr. W. 000 (r))*. The above photo shows a Russian crew manning a 107-mm in the Caucasus. The 107-mm is very similar to the 120-mm.

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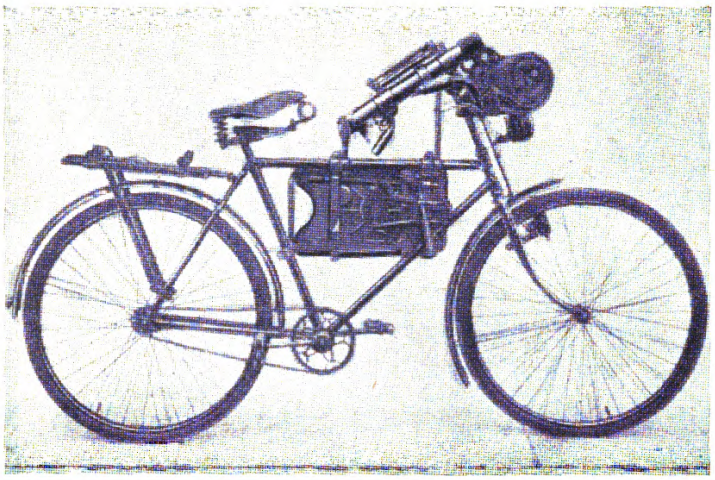


The 107-mm packs in nine loads. That shown above at right is the barrel and carriage frame. Ahead are ammunition loads. This is a Russian column. The adjusting nut on the right bipod leg (lacking in the 120) identifies a 107-mm.



A wheeled carriage frame is characteristic of the 107- and 120-mm mortars. This frame is quickly attached for towing or manhandling. It permits quick forward displacement without disassembling and reassembling the mortar.

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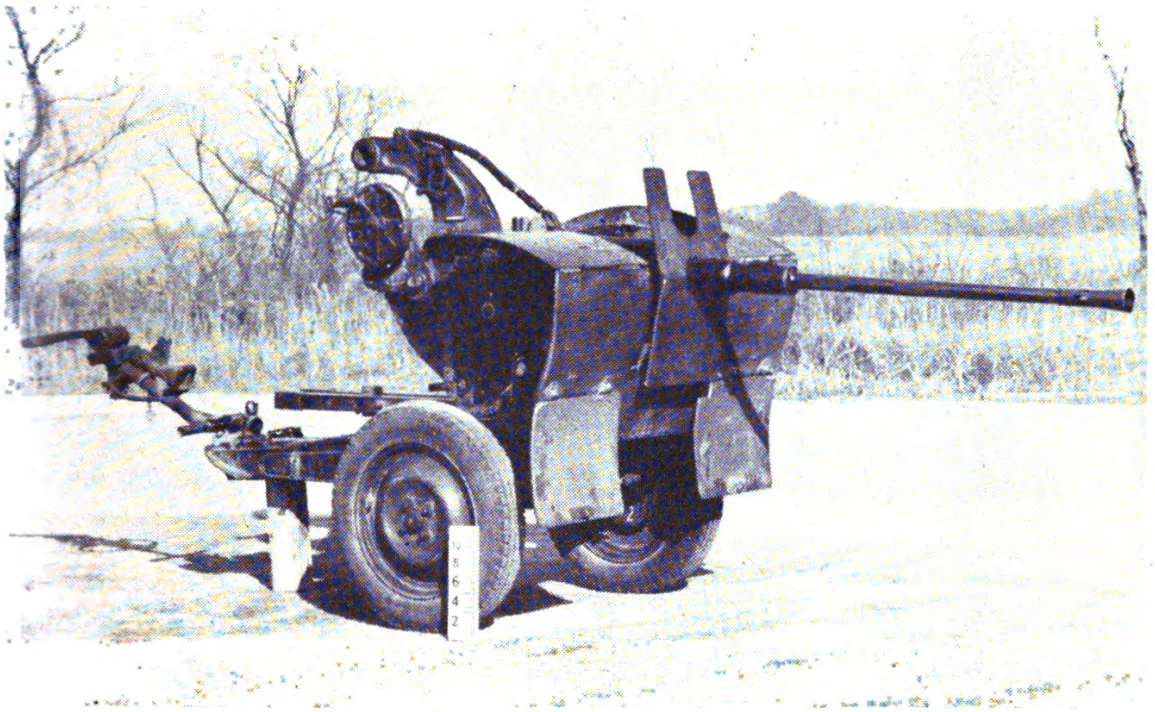


Bicycles of the division motorcycle battalion may carry 50-mm mortars (left), antitank rifles, and cases of 81-mm mortar ammunition.

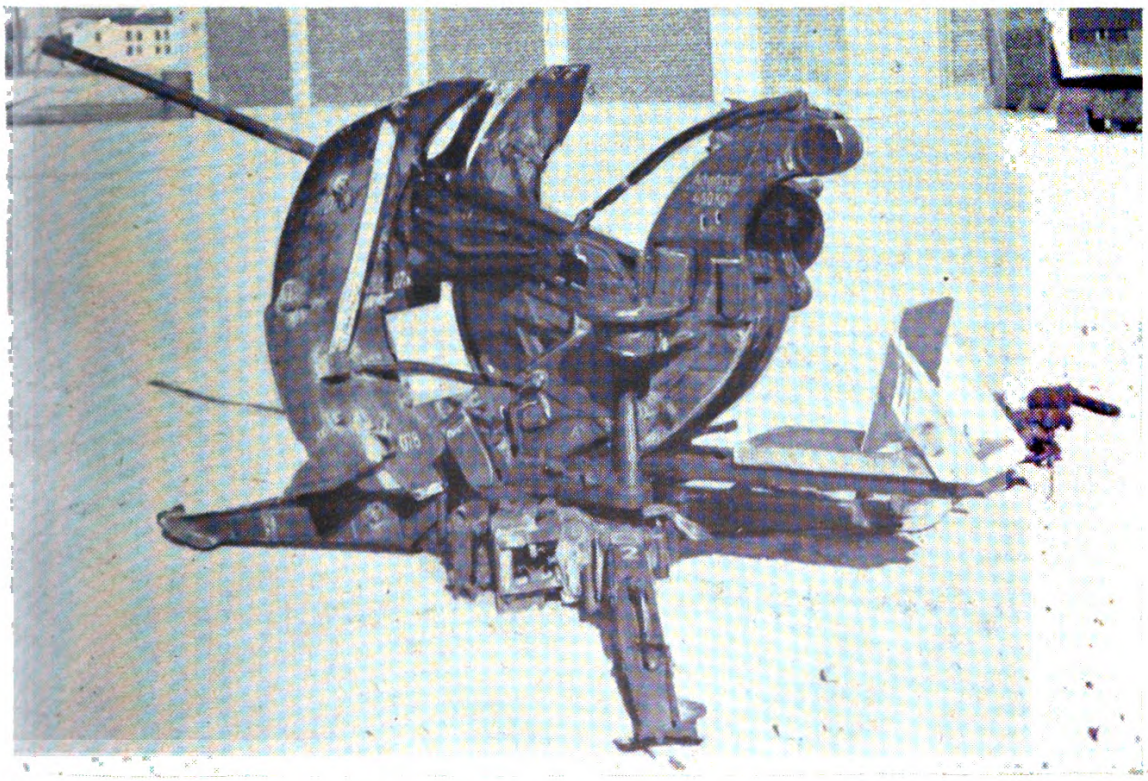
This mortar is said to be the German *12 cm W. Gr. 42*. Russian and German 120-mm mortars are identical.



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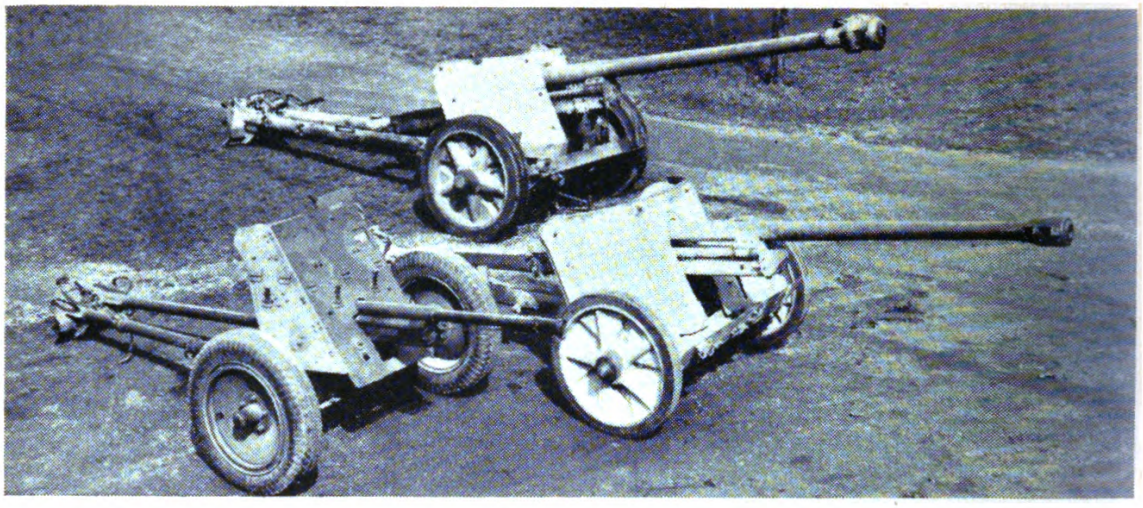


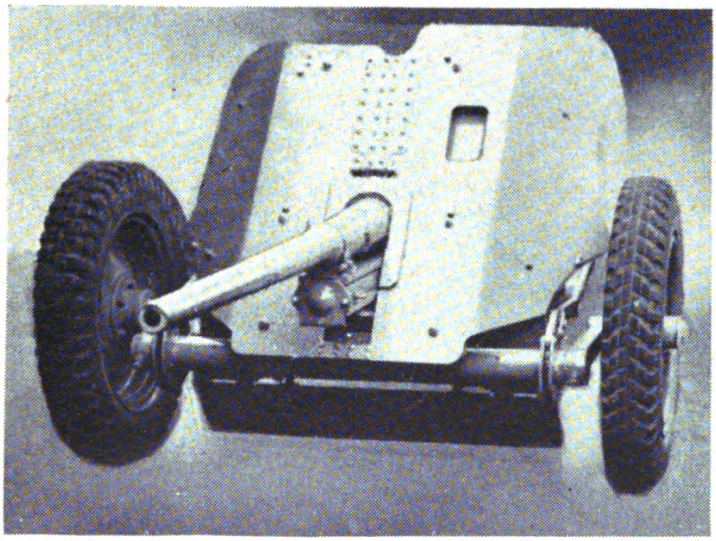
The 1,013-pound mountain antiaircraft gun *2 cm Geb. Flak 38* may be towed on its wheels or broken down into 27 loads. The heaviest load is 90 pounds.

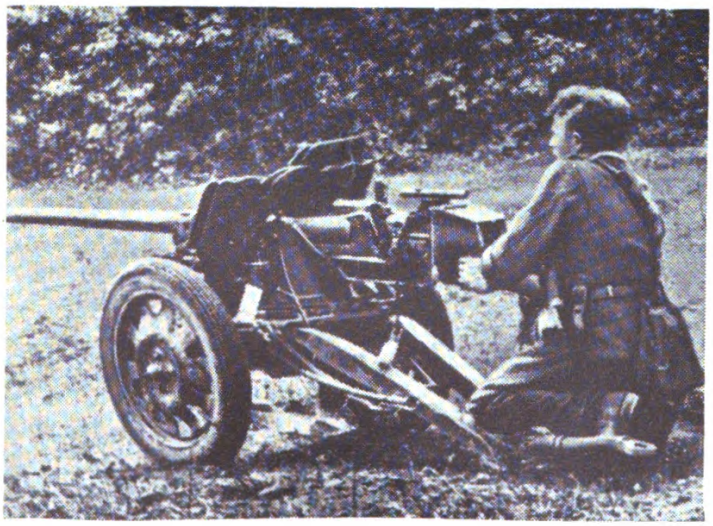


The *2 cm Geb. Flak 38*'s lightness results from use of many metal stampings. Because the gun above lacks its gunner's seat, an improvised seat is fitted.

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Antitank guns shown in the above picture may be encountered in mountain units. They are (left to right) the obsolescent *3.7 cm Pak 37*, the *5 cm Pak 38*, and (rear) *7.5 cm Pak 40*.

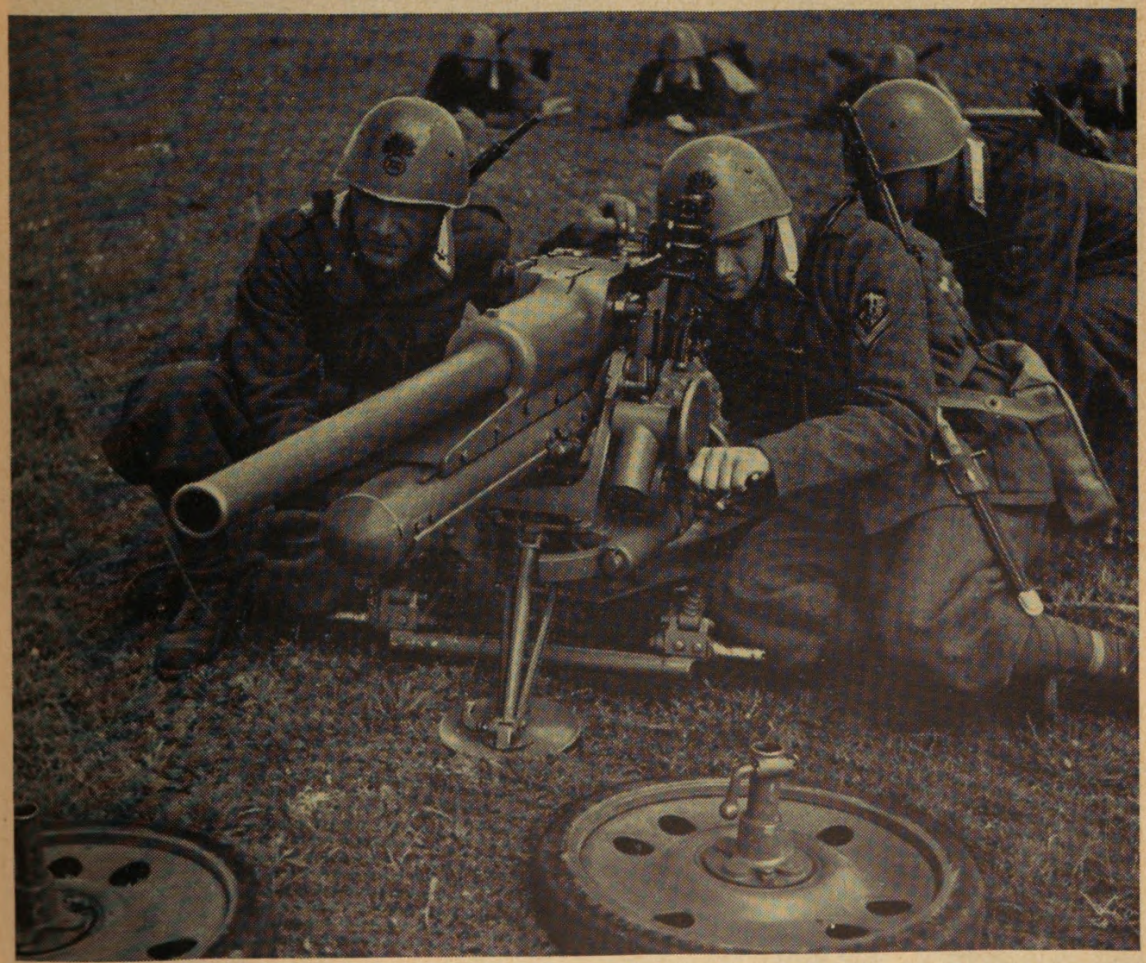
Because of its high ratio of penetration of projectile to weight of gun, the mobile, tapered-bore 42/28-mm *4.7 cm Ie Pak 41* is suitable for mountains. The gun pierces armor 3.03 inches thick at 500 yards. It is on the *3.7 Pak* carriage, with double shield.

While a 42/28-mm antitank gun may be manhandled by two men, the tapered-bore 28/20-mm *s. Pz. B. 41* may be pulled on the run by a single man, even though the ground is very rough. At left, a mountaineer in the Caucasus fires a 28/20.

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German mountain police (both state and *SS*) are armed largely with obsolescent and captured weapons. Above, police in North Italy fire the Italian 47/32.

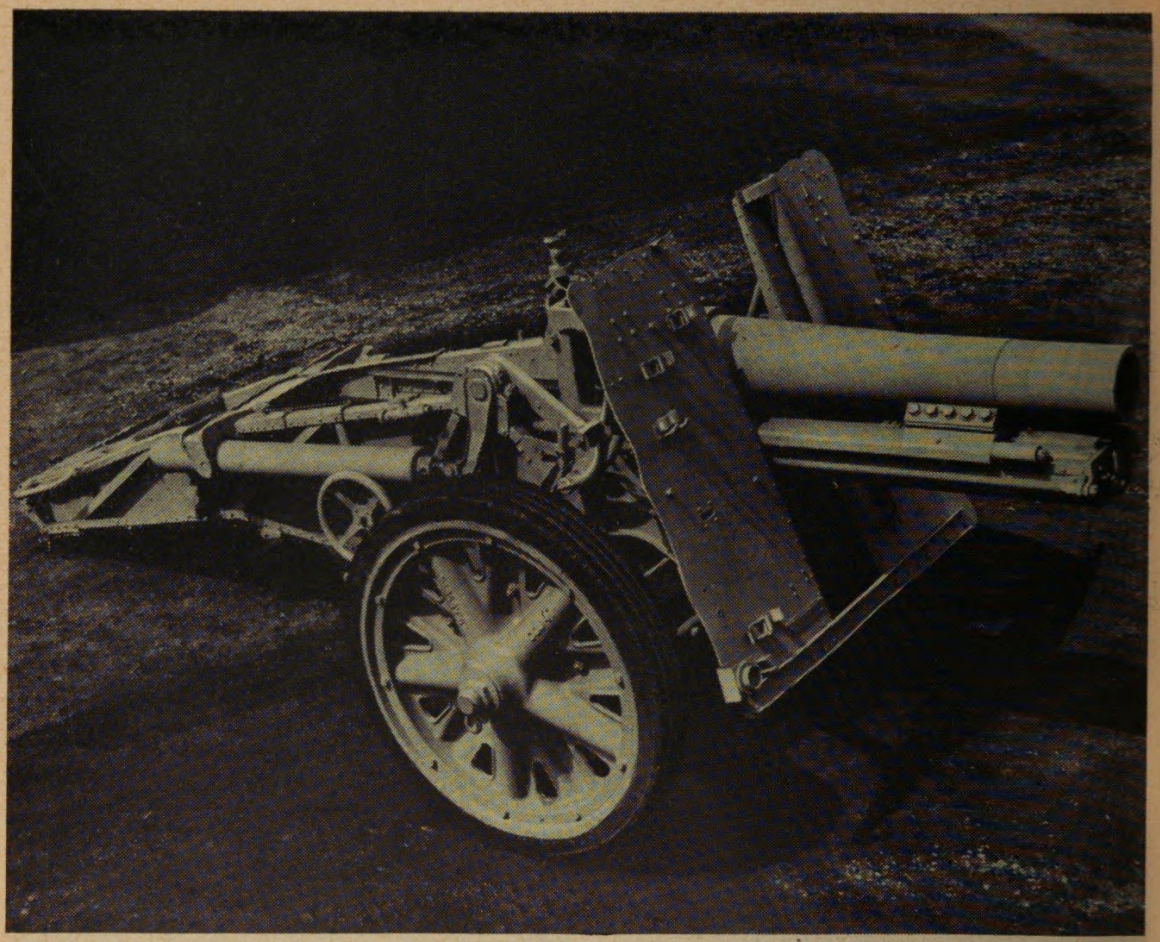


The Italian 47/32 may be packed like the similar Austrian and Dutch 47-mm Böhler AT. Cartridge cases for the 47/32 are 36-mm longer than the Böhlers'.

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The 150-mm heavy infantry howitzer (*s. I. G. 33*) is not modified for mountain use, but is employed by mountain units operating in terrain with good road nets, or where the tactical situation is fairly static. The photograph at left shows mountain troops wearing summer uniforms and firing the 150-mm howitzer during the siege of the city of Novorossiisk.

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The mountain infantry howitzer (shown above in Russia in 1944) has a tubular split trail. Sometimes it is replaced by the Skoda M15 75-mm mountain gun.

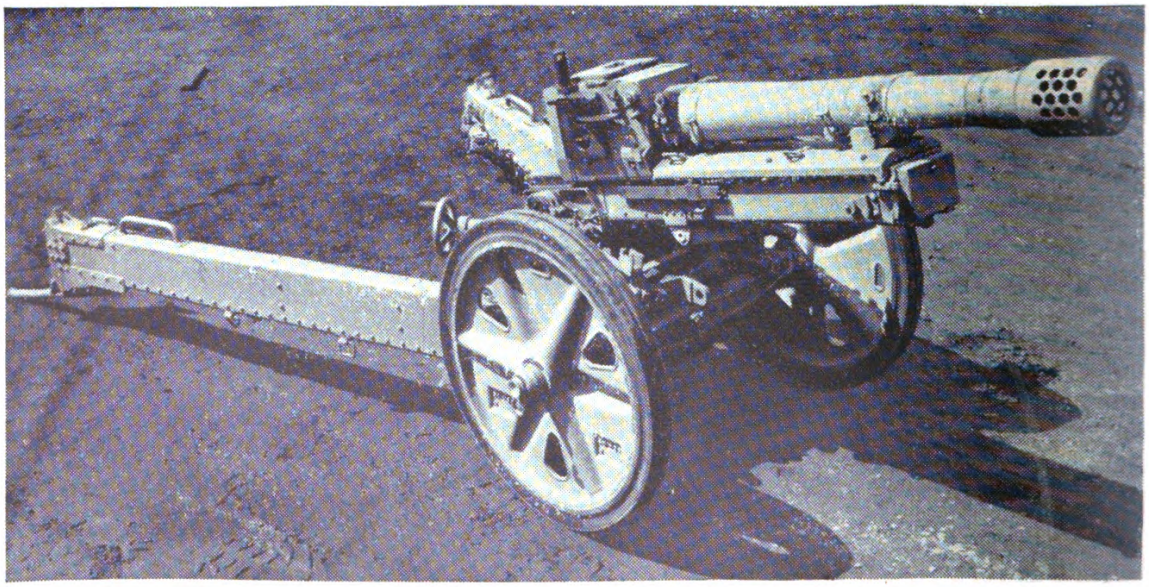


Easily manhandled, the light *15 cm Nebelwerfer 41* is a mountain substitute for medium artillery. It salvoes six 77-pound rocket projectiles every 8 minutes.

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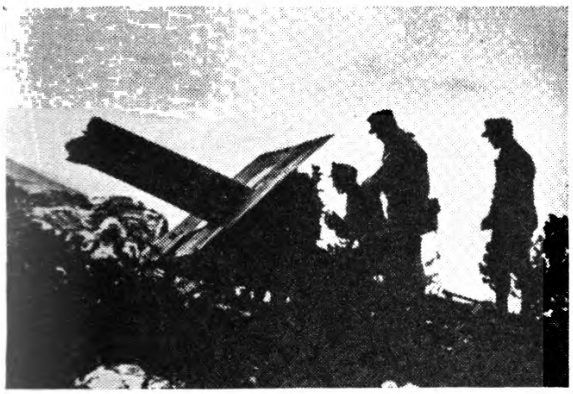


The *7.5 cm Gebirgs Geschütz 36* weighs 1,600 pounds and has an extreme range of 10,000 yards. It is shown on Mount Elbrus (Caucasus), altitude 18,400 feet.



The new M36, heavier and longer-ranged than the M15 gun, is classed as a howitzer, since an equilibrator between the split trails permits 70 degrees elevation to the M15's 50. Large skis may be substituted for the wheels.

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The Skoda M16 100-mm mountain howitzer has an extreme range of 9,000 yards.



The M16 in recoil. M16/19's have longer tubes, and 10,800 yards extreme range.

MOUNTAIN ARTILLERY

German mountain artillery (*Geba*) consists of those weapons which may be broken down into loads for transport on pack animals, or which break down into several loads for transport on two-wheeled carts. Such breakdowns also permit roping up and down steep cliffs. The standard piece—*the 7.5 cm Geb. K. 15*—is considered in Europe the most successful mountain artillery piece yet developed. It may be issued to normal infantry units operating in the mountains. Large numbers of M15's captured from other armies are now used by the Germans. The 75-mm *Geb. G. 36* does not appear to be replacing the M15, nor does the new 105-mm *Geb. H. 40* appear to be in wide use.

In terrain where the mobility of medium and heavy artillery is limited, heavy support fire is furnished by rocket projectors of the *Nebelwerfer* series. Easy to transport, the six-barreled *15 cm Nebelwerfer 41* (p. 79) can easily be handled by two men; and its more effective counterpart, the five-barreled *21 cm Nebelwerfer 42,* weighs even less (1,100 pounds). A third rocket projector suited to mountain warfare is the *30 cm Nebelwerfer 42,* which consists of six crates or racks mounted on a two-wheeled carriage with split trail. Similar is the *28/32 cm Nebelwerfer 41.* Removable liners make it possible to fire 280-mm or 320-mm rocket projectiles from this *Nebelwerfer.* The 28, 30, and 32-cm rockets may also be fired from their own carrying crates. All these *Nebelwerfer* are mounted on pneumatic-tired carriages and may be towed by light half-tracks.

Mountain artillery is of particular interest, for (as is the case with other mountain weapons) its lightness fits it for use in airborne operations.

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The 1,380-pound M15 has greater mobility than the M36 but is inferior in performance to the newer model. Mats on the snow keep the wheels from sinking.



The M15's of all nations display the characteristics shown in this view of one without a shield. The maximum range of the German model is 7,250 yards.

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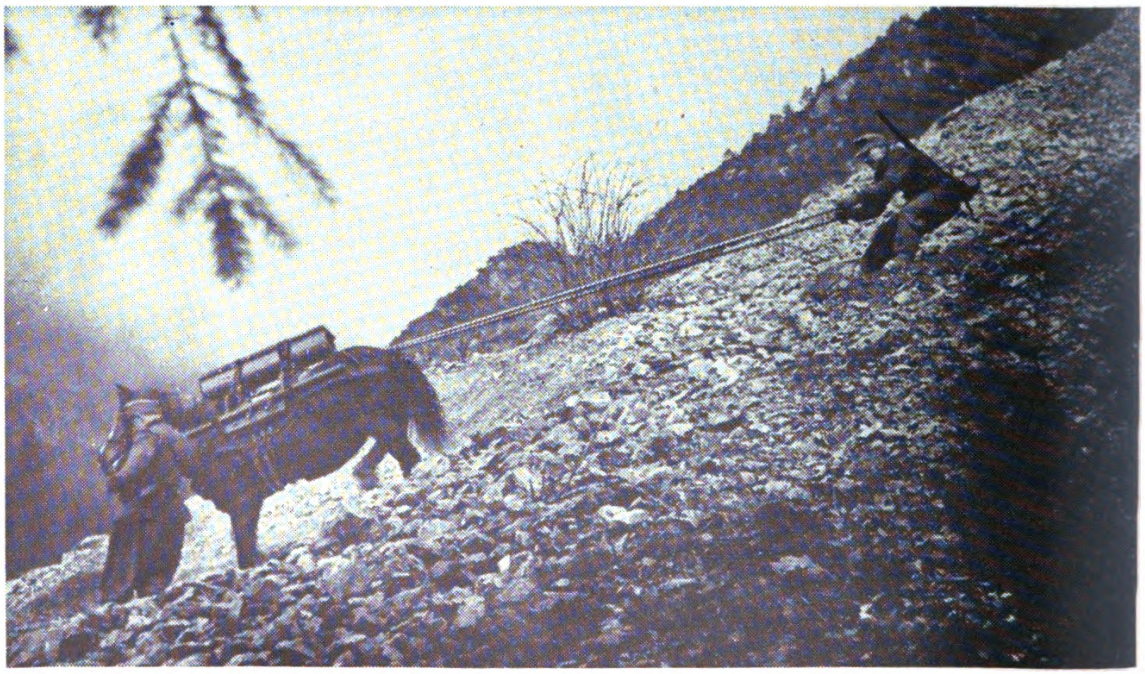


Germans believe that mountain positions must be strongly fortified, since they are hard to conceal and the muzzle blast may produce revealing clouds of snow.

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This mountain artillery pack train carries a Skoda M15 howitzer. This piece loads on 7 mules, the 7th carrying the shield. The M36 is carried on 6 mules.



Check lines are held by soldiers to keep pack loads from slipping forward when animals descend steep slopes. This mule carries the cradle for the M15 gun.

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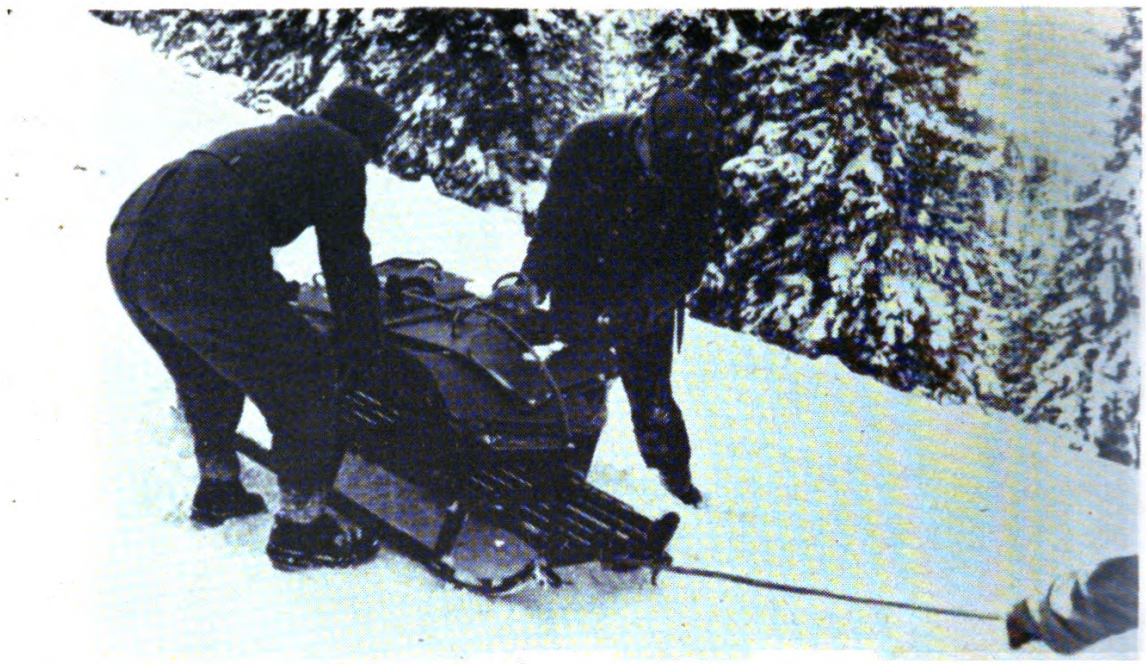


Jägers of a light division load a 75-mm gun tube on a pack saddle. The use of two poles, as shown above, is standard for manhandling mountain-gun tubes.



The tube is packed on top of the saddle, while the two wicker mats, to be used under the wheels, are slung alongside. The checkline man steadies the load.

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Pack animals are useless in snow deeper than 16 inches. Loads like this shield of a Skoda M15 can be hauled on sleds. Fifteen skiers haul one gun.

Soldiers haul a loaded sled up a mountain trail, using a rope run through a snaplink fastened to a piton in the rock wall.

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Artillery loads must sometimes be manhandled in the last stages of going into position. The M15 breaks down into six one-man loads and five two-man loads.

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A tree-trunk boom with block and tackle makes possible the negotiation of precipitous cliffs. This is the heavy front trail section of a German Skoda M15.

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Complete pieces may be assembled on a height and lowered into firing position intact. This procedure saves time and facilitates emplacement on cliff sides.

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CHARACTERISTICS OF MOUNTAIN ARTILLERY USED BY GERMAN FORCES

While the M15 Skoda, the M16 100-mm Skoda, and the M36 gun represent the most common German mountain artillery pieces, many other models are available to the German forces. These may either be German in origin, or else captured from other armies. In the table below and on the following pages are listed and pictured many of the most important models. Note that many field guns (*F. K.*) and field howitzers (*F. H.*) have been adapted for use in mountainous regions.

Weapon (with manufacturer and using Nations)	Caliber in millimeters	Length of tube in calibers	Weight of HE shell in pounds	Maximum range in yards	Weight in firing position	Number of pack o cart loads
6.5 cm Geb. K. 216 (i) (Italian 65/17)	65	17	9.15	7,100	1,144	6.
6.5 cm Geb. K. 221 (f) (French M1906—used by Poland, Yugoslavia).	65	20.2	9.8	5,500	1,504	4.
7 cm Geb. K. 99 (Austrian—used by Croatia).	72.5	13.8	-------	5,720	690	3.
7.5 cm Geb. K. 15 (Skoda—used by Austria, Italy, Poland, Germany, Bulgaria, Rumania, Yugoslavia, Hungary, Czechoslovakia).	75	15.4	12	7,315	1,386	6 (7 with shield).
7.5 cm Geb. G. 36 (German)	75	13	{12 & 13}	10,116	1,600	6.
7.5 cm Geb. K. 254 (i) (Italian Ansaldo 75/18 M1934 and M1935).	75	18.3	14	10,280	1,760	8.
7.5 cm Geb. K. 28 (in *Einheitslafette mit 9 cm Geb. H.*) (Skoda—Yugoslav).	75	18	15	10,340	1,562	7 (8 with shield).
7.5 cm Geb. K. 238 (f) (M1928 Schneider—used by France, Poland).	75	19	14	10,450	1,496	7–8.
7.62 cm Geb. K. 293 (r) (Russian M1909)	76.2	16.4	14.3	--------	1,368	7.
7.62 cm Geb. K. 307 (r) (Russian M1938)	76.2	21.4	13.7	11,110	1,727	Probably 7 with shield.
7.65 cm F. K. 304 (j) (M1928 koda—used by Yugoslavia, Czechoslovakia).	76.5	40	16	15,400	3,740	3 two-wheeled carts.
7.65 cm F. K. 5/8 (t), (ö), F. K. 300 (j), 7.65 cm F. K. (i) (Skoda—used by Czechoslovakia, Austria, Yugoslavia, Italy).	76.5	30	14.6	11,220	2,214	3 two-wheeled carts.
7.65 cm F. K. 17 (t), (ö), F. K. 303 (j) (Skoda—used by Czechoslovakia, Austria, Yugoslavia).	76.5	30	17	11,550	2,903	In several loads for towing.
8 cm le. F. K. 18 (ö) (Skoda—Austrian)	83.5	33	22	13,200	3,256	3 two-wheeled carts.
10 cm le. F. H. 317 (j) (M1928 Skoda-Yugoslav).	100	28	35.5	12,100	3,894	3 two-wheeled carts.
10 cm le. F. H. 14 (ö) (Skoda—used by Austria, Italy).	100	19	35	9,240	3,117	3 two-wheeled carts.
10 cm le F. H. 30 (t) (Skoda—Czech)	100	25	35	11,660	2,856	3 two-wheeled carts.
10 cm le. F. H. 35 (Skoda—Rumanian)	100	27.8	36	11,660	3,443	On several carts, or (if special carriage) 12 loads.
10 cm Geb. H. 16, 16 (ö), 316 (i) (Skoda—used by Germany, Austria, Italy, Poland, Yugoslavia, Czechoslovakia).	100	19.3	35	9,020	2,717	3 two-wheeled carts.

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CHARACTERISTICS OF MOUNTAIN ARTILLERY USED BY GERMAN FORCES

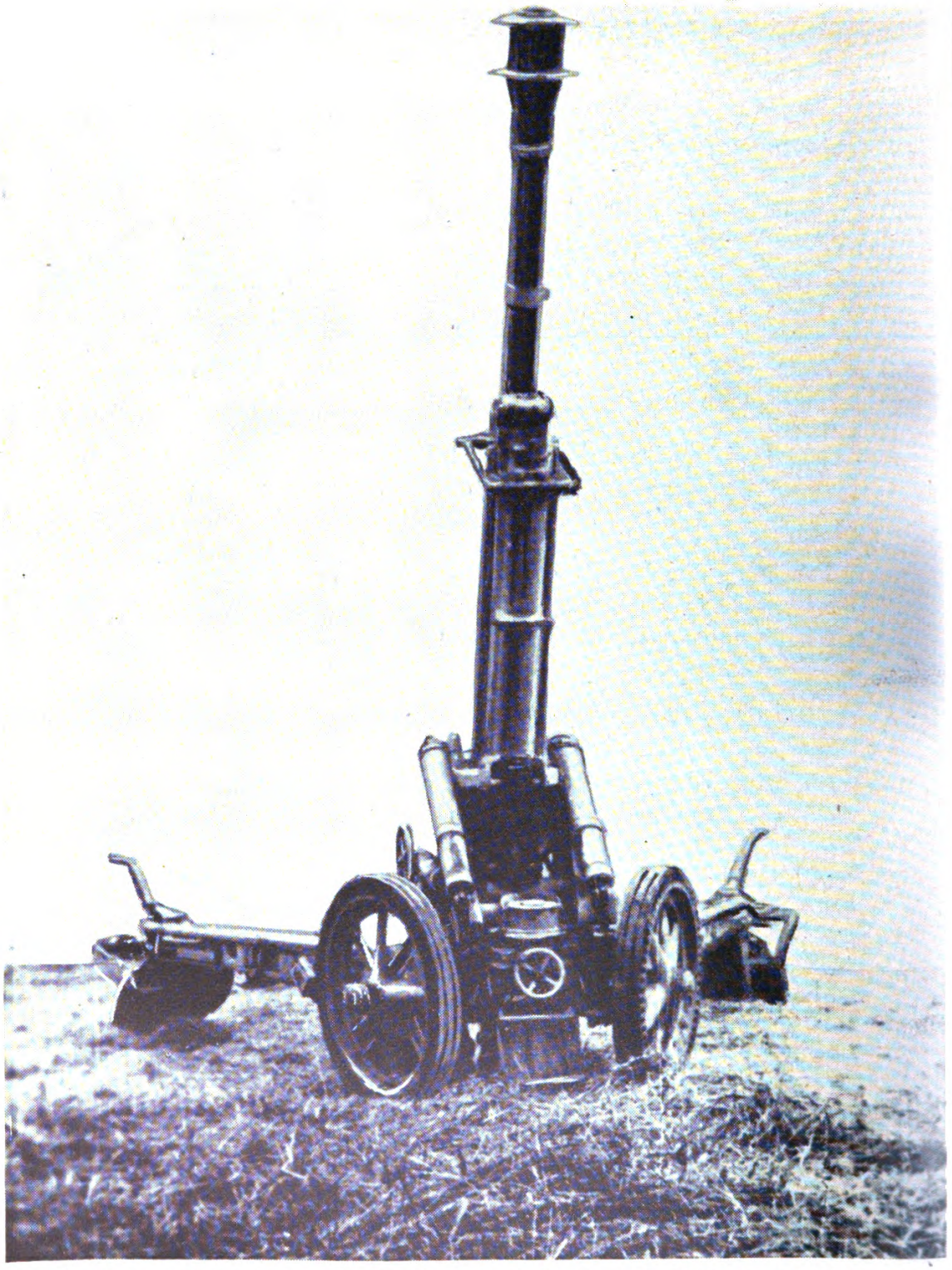
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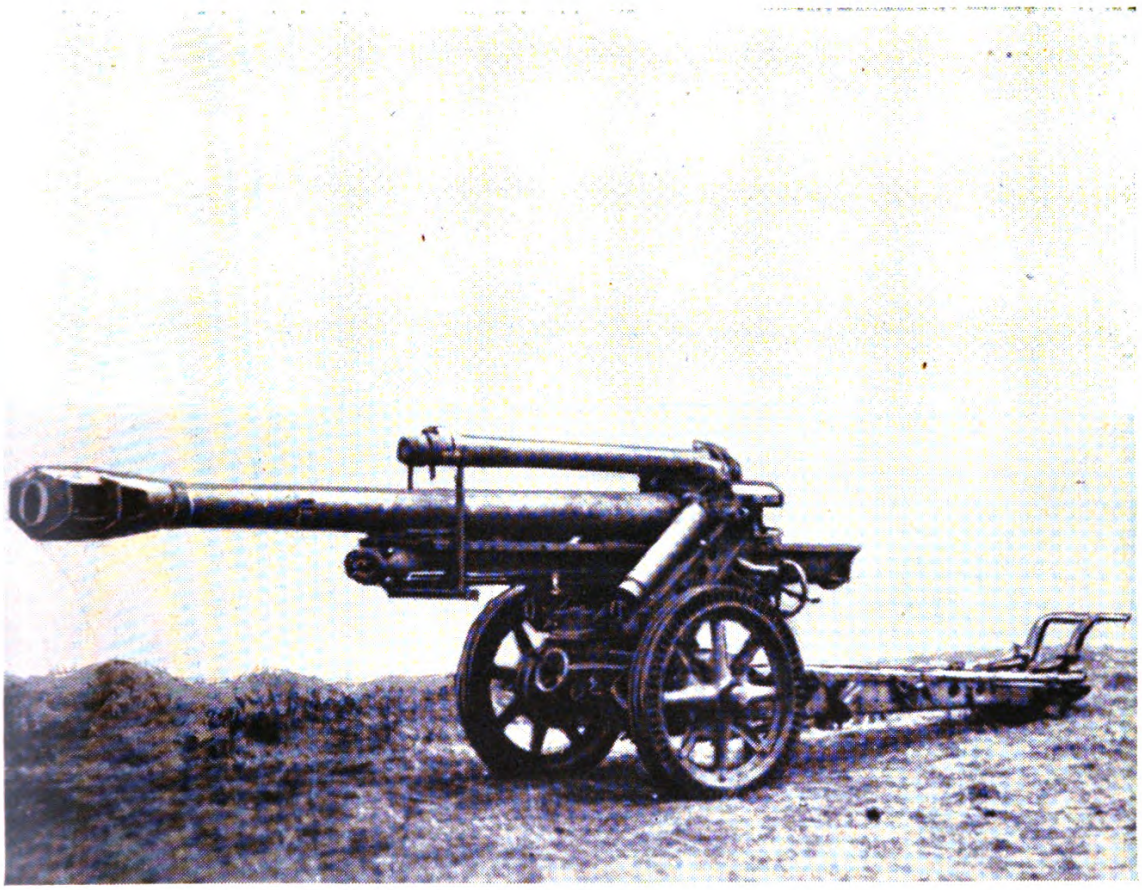
Weapon (with manufacturer and using Nations)	Caliber in millimeters	Length of tube in calibers	Weight of HE shell in pounds	Maximum range in yards	Weight in firing position	Number of pack or cart loads
10 cm Geb. H. 16/19 (t) (Skoda—used by Czechoslovakia, Italy).	100	24	35	10,780	2,970	3 two-wheeled carts.
10.5 cm Geb. H. 40 (German).....	105	32.6	32.6	13,807	3,360	Probably two-wheeled carts.
10.5 cm Geb. H. 322 (f) (Schneider—used by France, Spain).	105	12.4	27	8,690	1,650	8.
10.5 cm Geb. H. (t) (Skoda—Czech)....	105	24	31	11,880	3,080	3 two-wheeled carts.
15 cm Geb. H. 18 (t) (Skoda—used by Austria and Czechoslovakia).	149	4	92	8,800	6,080	7 two-wheeled carts (tube cart: 3 horses).

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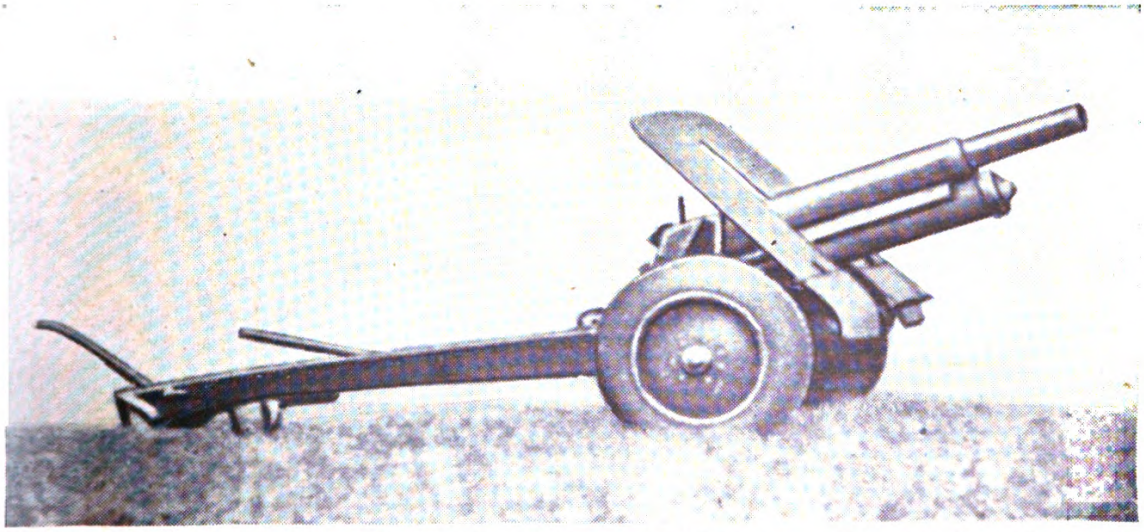


The German mountain howitzer *10.5 cm Geb. H. 40* (shown above in firing position) has a life of 15,200 rounds with ordinary charges. This specimen was taken in Normandy from an infantry division equipped for airborne operations.

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The split-trailed *Geb. H. 40* breaks down into 12 assemblies, some of which are so heavy as to preclude loading on pack animals. It is therefore presumed that this piece is to be transported as three two-wheeled loads (see p. 95).

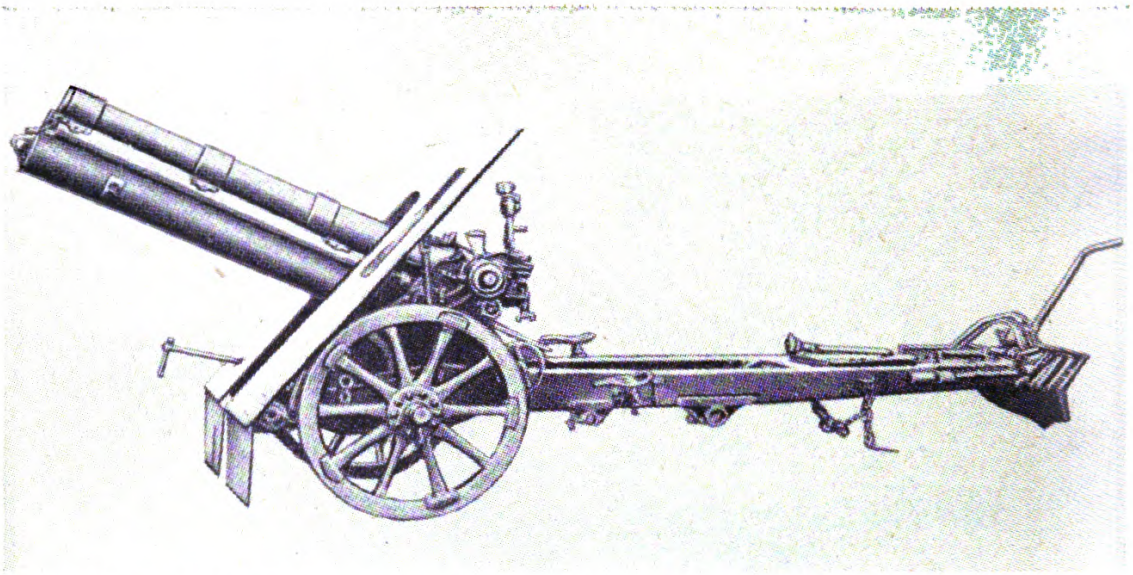


When in German service, the Soviet 76.2-mm M1938 mountain gun is called *Geb. K. 307 (r)*. It has a box trail, sponge-rubber filled tires, and may be drawn by four horses. There are three other models of Russian mountain guns.

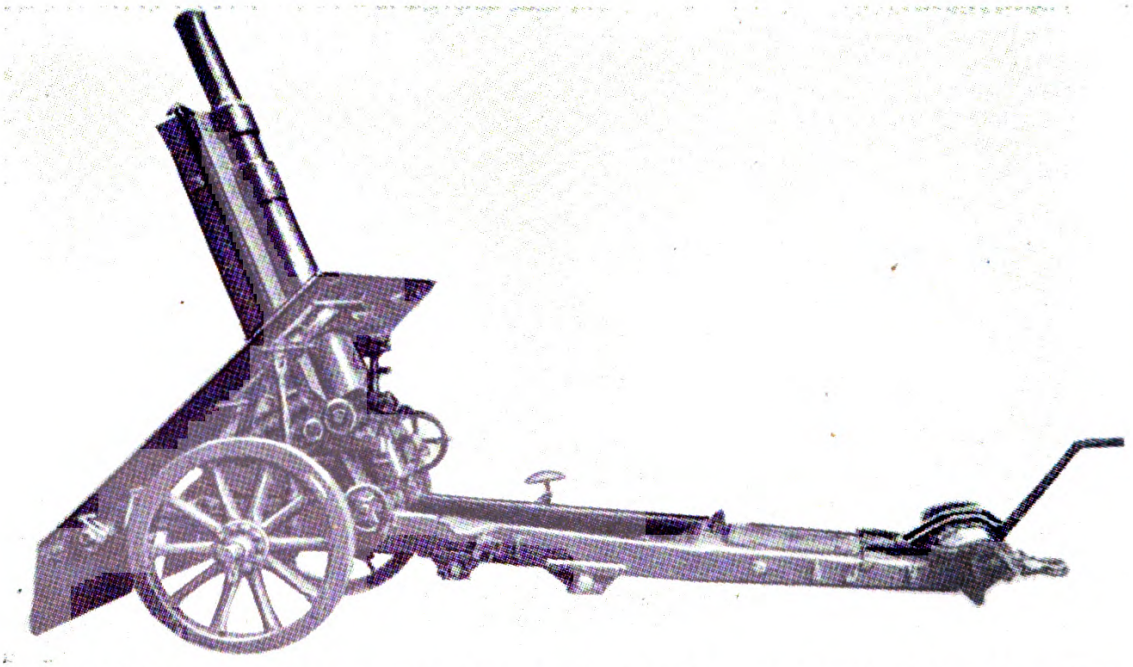
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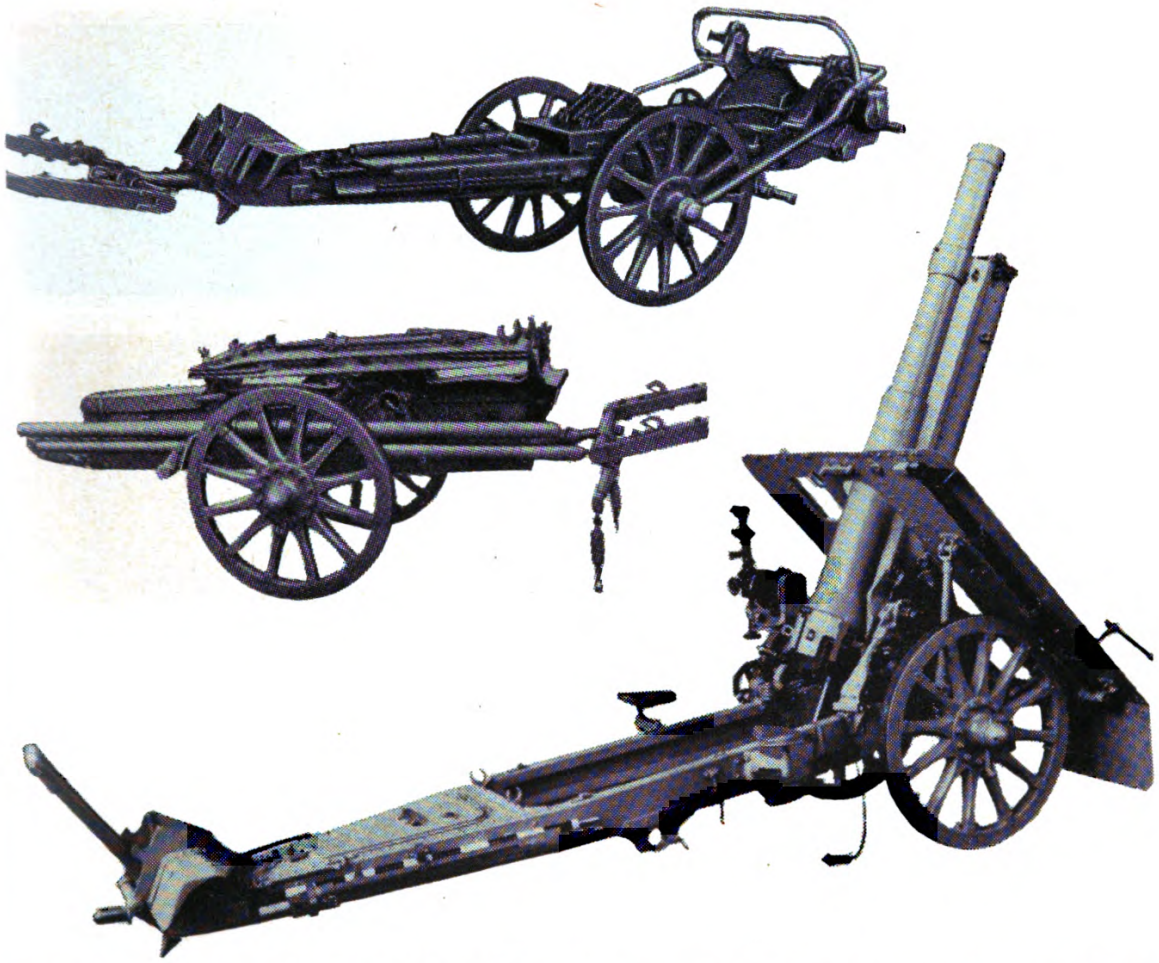


The 100-mm M16 is classed as a howitzer because it has greater elevation than the 75-mm M15 gun (70 as compared with 50 degrees). The M16 breaks down into three loads for two-animal carts as does the 105-mm howitzer shown opposite.

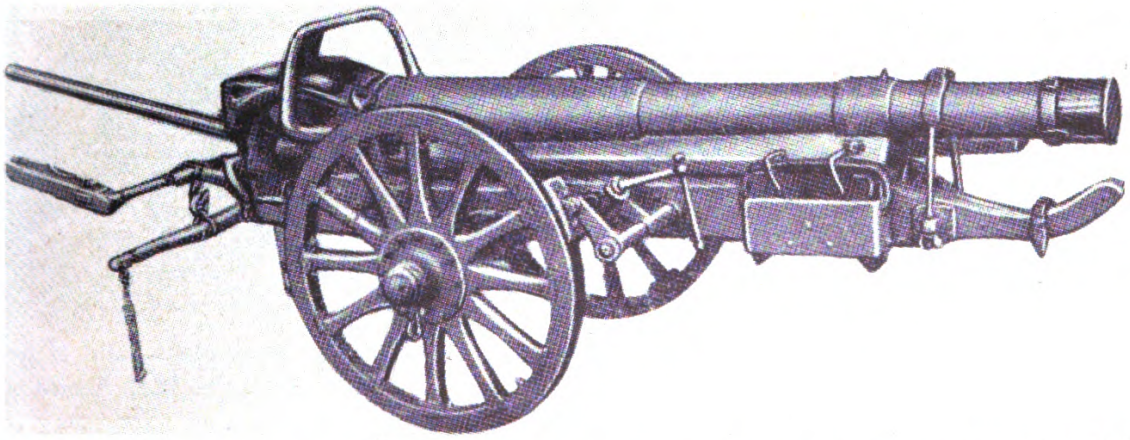


The M16/19 has a longer tube than the M16. It, too, breaks down into three loads for traction on the broad trails common throughout European mountains.

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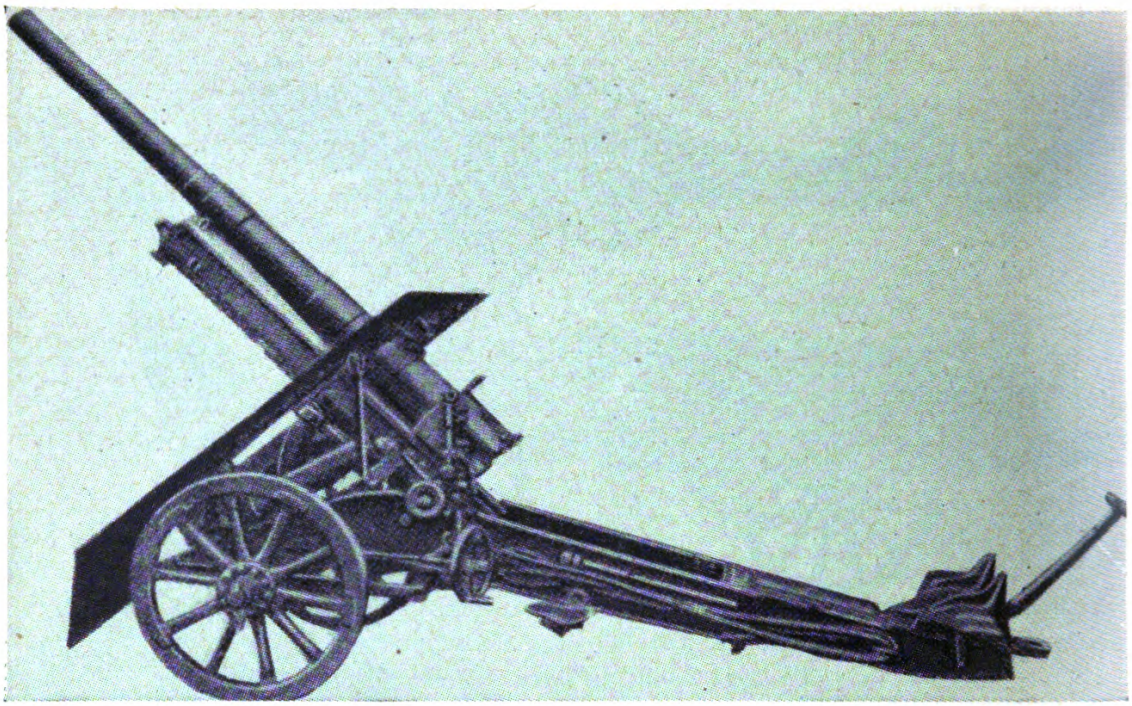


The 105-mm howitzer taken by the Germans from the Czech Army is a modernized M16/19, and is called *10.5 cm Geb. H. (t)*. It breaks down into three loads. Trail and top carriage loads are shown above the photo of the piece itself.

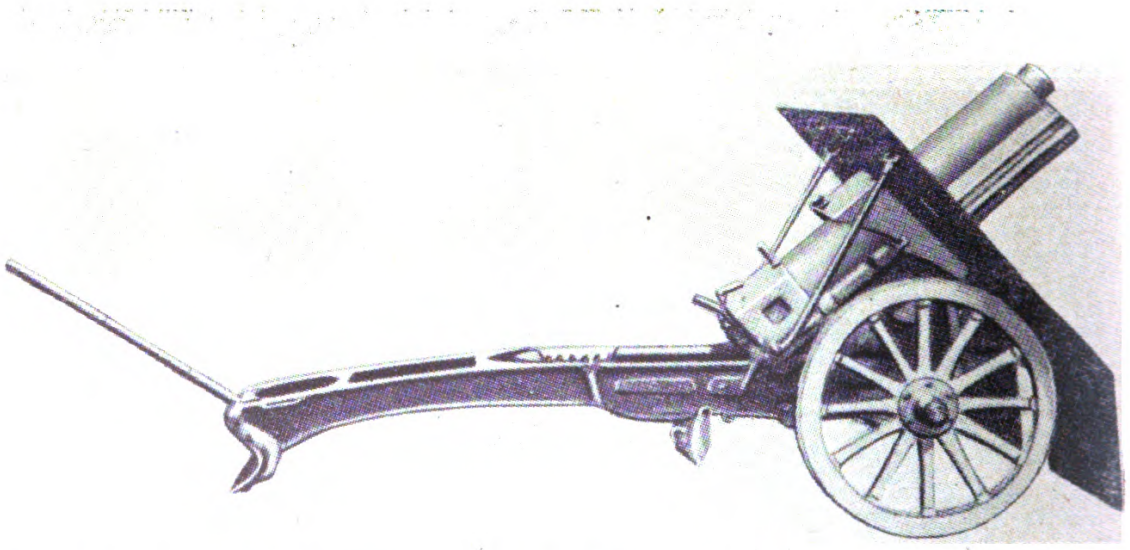


Like the other loads pictured above, the tube load of the *Geb. H. (t)* travels on a two-wheeled cart. Each cart is drawn by two horses or mules, in tandem.

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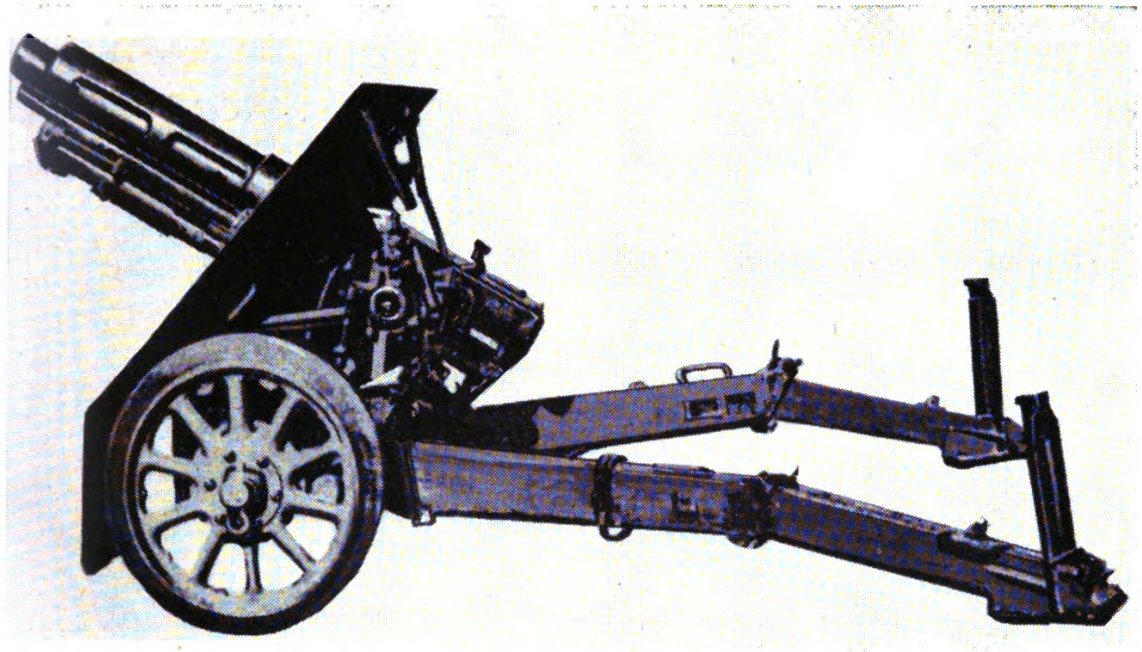


Minor adjustments and the provision of small wheels fit the ex-Austrian M18 83-mm field gun and carriage for use in mountains. It travels in three loads.

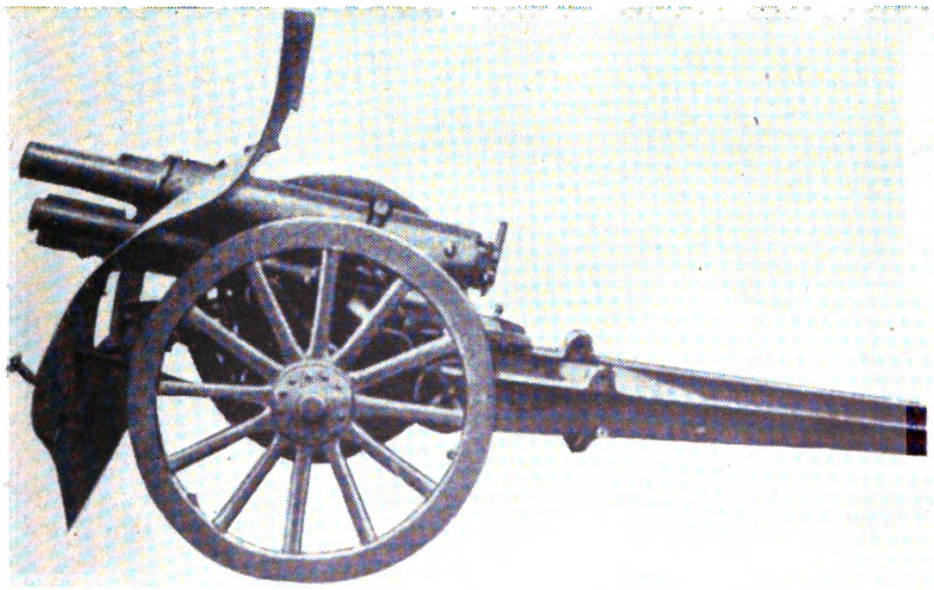


The M1928 75-mm Skoda mountain gun was purchased by Yugoslavia, and is now employed by German and Croat troops. The M1928 resembles the M15 Skoda.

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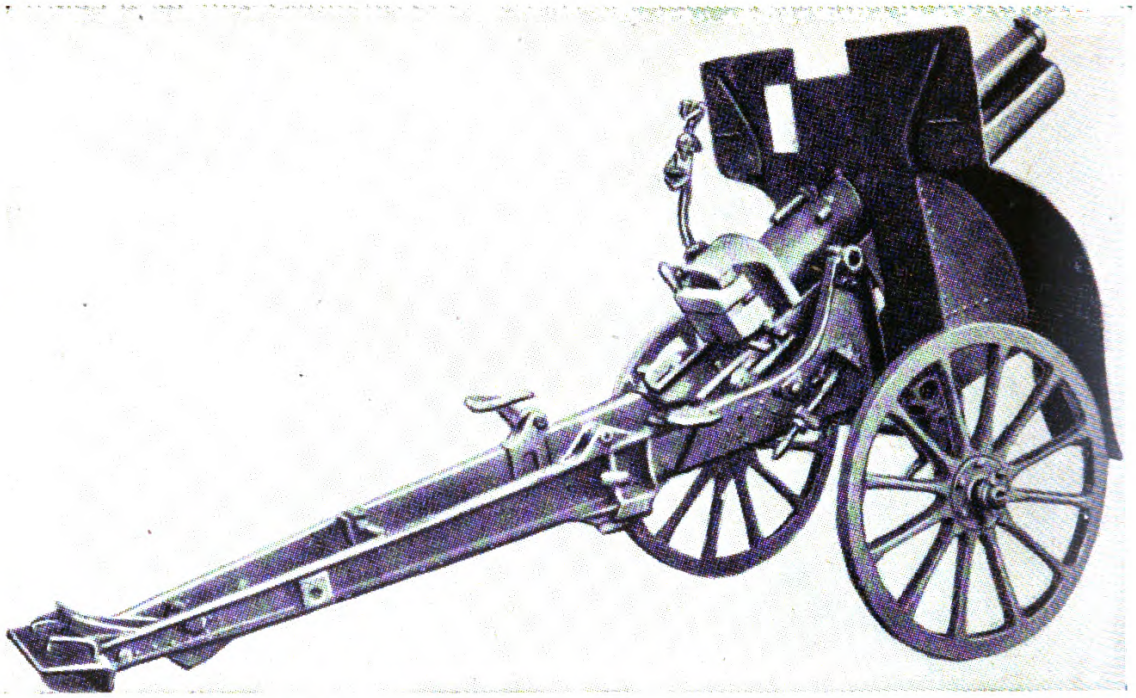


The new Italian mountain gun is known to the Germans as the *7.5 cm Geb. K.* (*i*); the Italian 75/13 M15 Skoda, once *Geb. K. 259* (*i*), now is called *Geb. K. 15.*

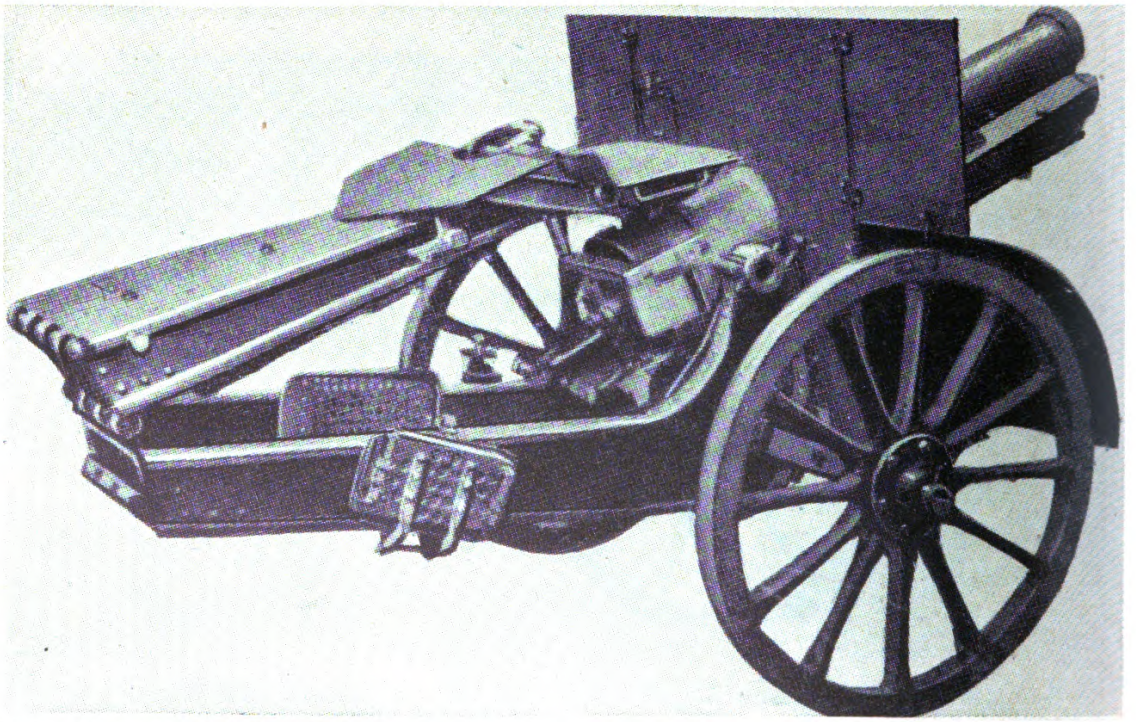


The Schneider-Danglis mountain gun was used in both Greek and Russian armies. The Greek model is 75-mm in caliber, the Russian (*Geb. K. 293* (*r*)) 76.2.

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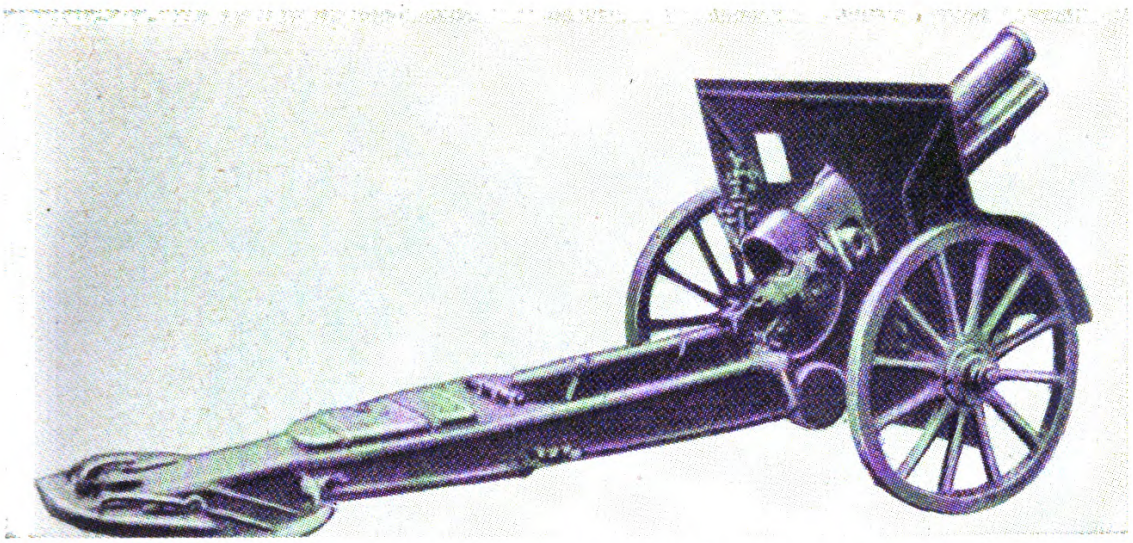


The French 75-mm M1919 mountain gun resembles the M1919 105-mm howitzer. Their Schneider folding trail feature is found in Russian mountain guns.

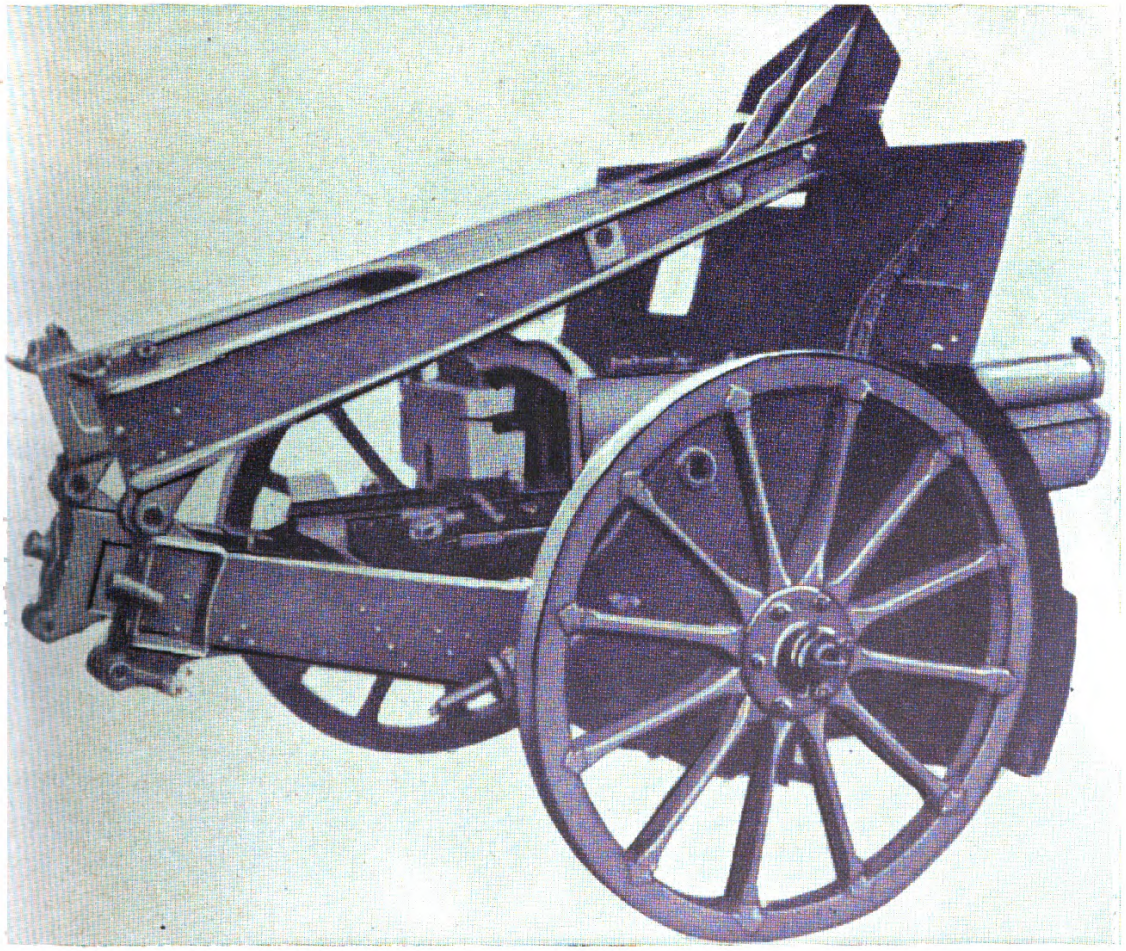


The Germans have used the M1919 105-mm mountain howitzer on the Russian front. Both the 75-mm gun and the 105-mm howitzer are Schneider weapons.

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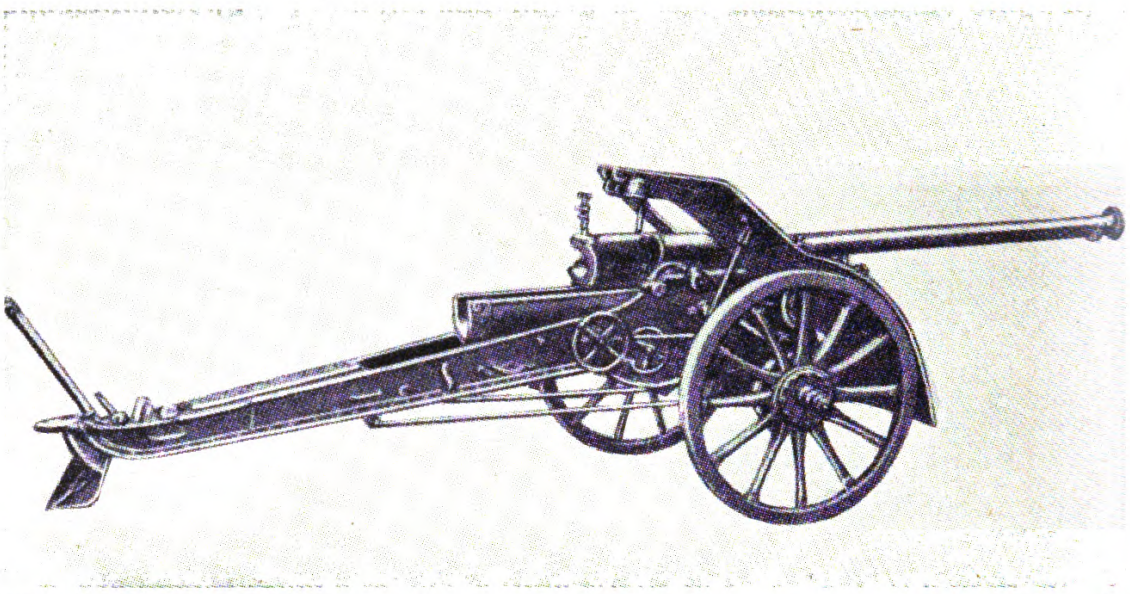


The Germans used the M1919 105-mm mountain howitzer on the Russian front.

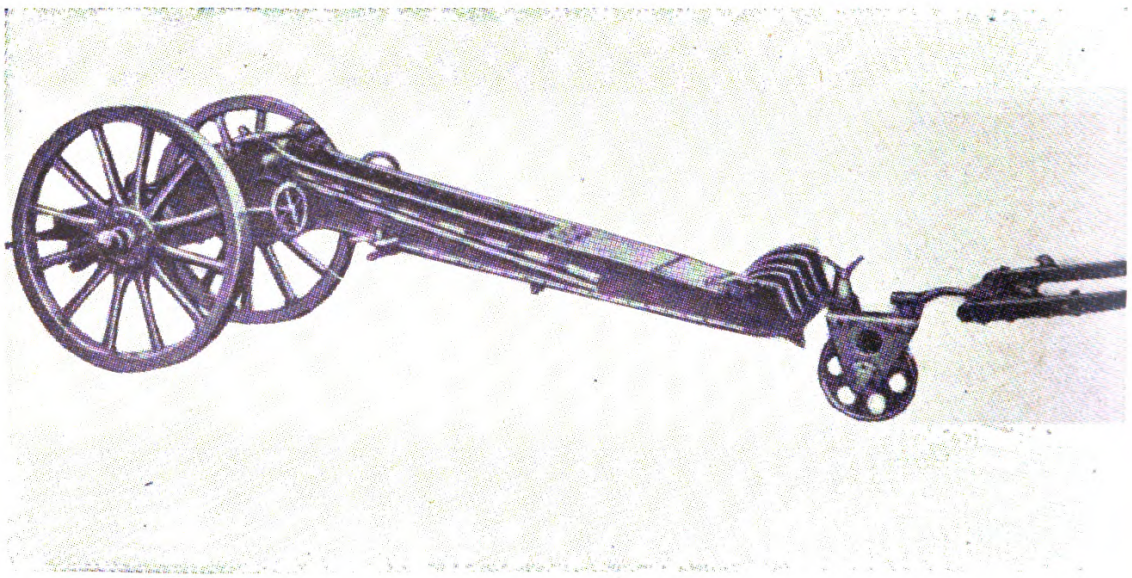


Folding trails of 75-mm (above) and 105-mm permit towing on narrow mountain roads.

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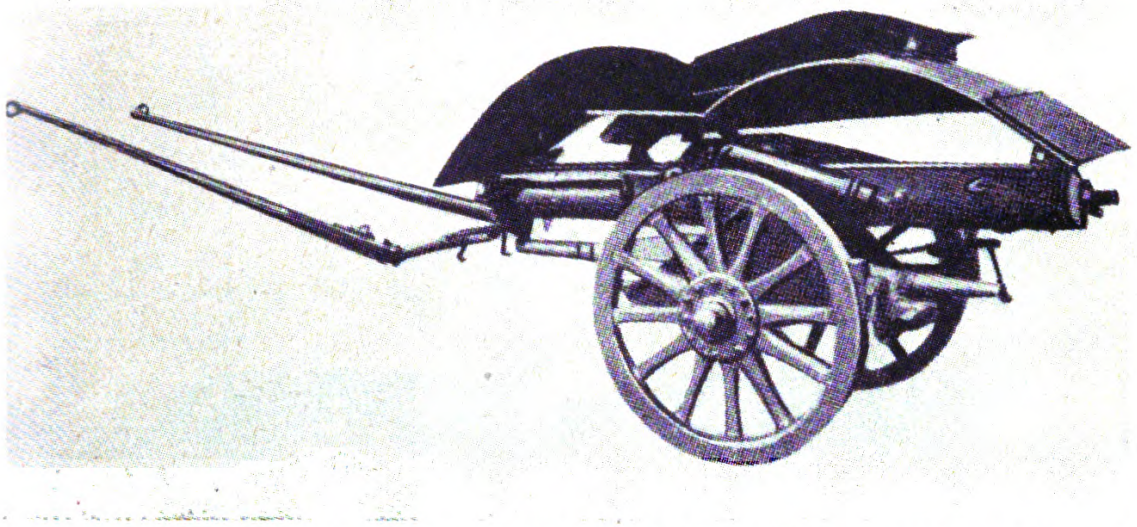


The Austrian Army and the Skoda arms firm have designed many field pieces for adaptation to mountain use. Above is one such gun, the Skoda 76.5-mm M1928.

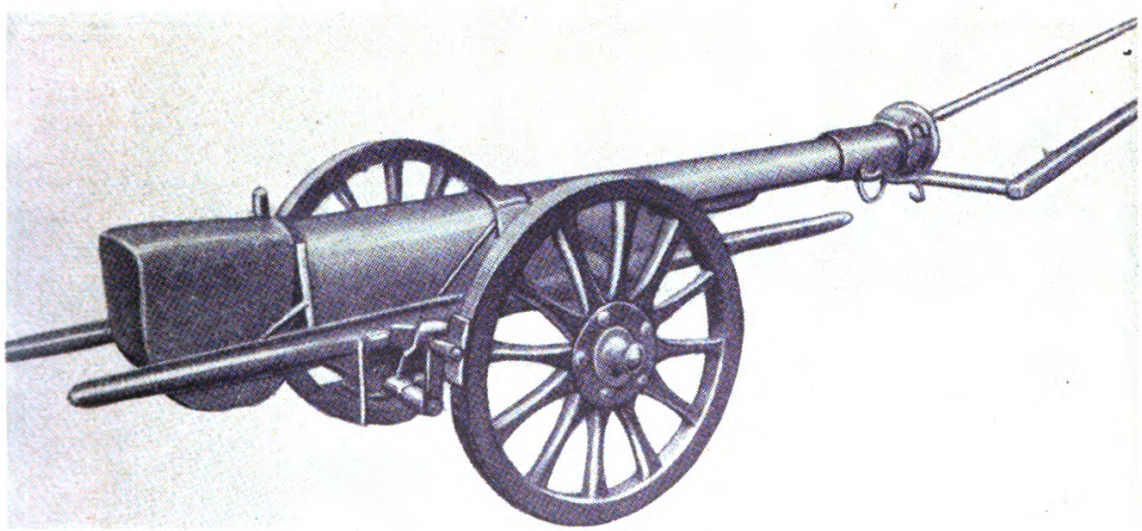


The 76.5-mm M1928 breaks down into three loads as do the Skoda mountain howitzers. The 76.5-mm gun is on the same carriage as the 100-mm M1928 howitzer. Both pieces were in service in the Yugoslav Army (see p. 102).

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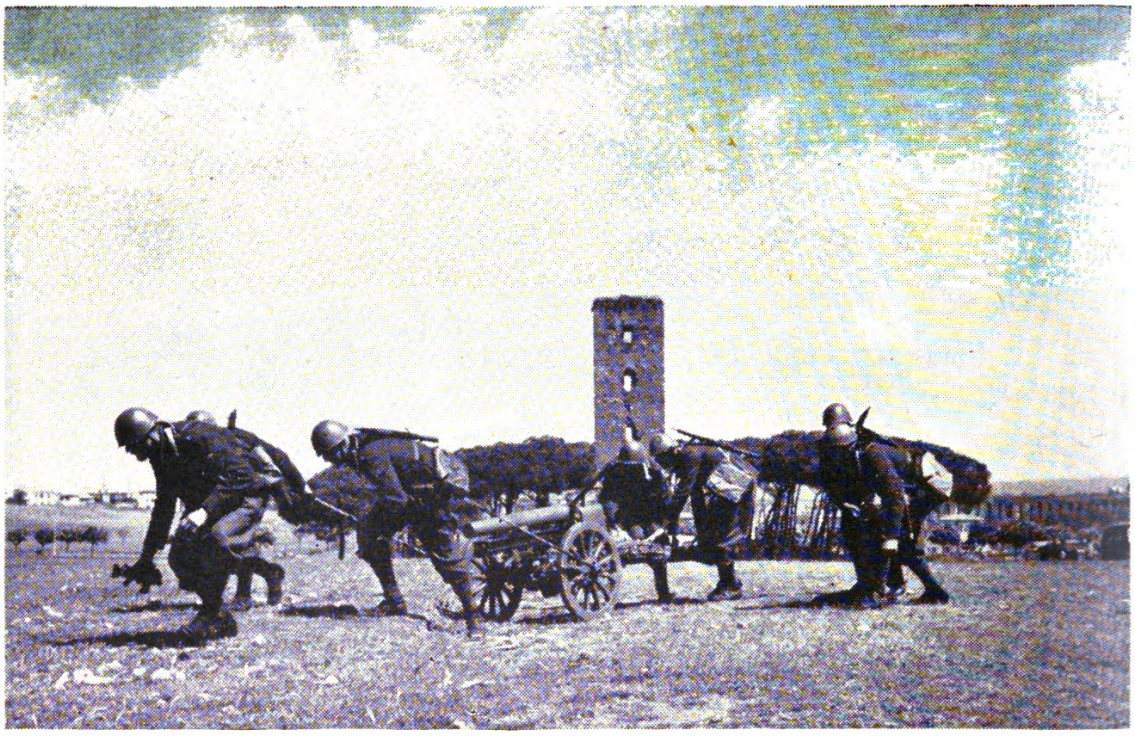


The top carriage, cradle, and shield of the 76.5-mm M1928 travel on the usual small-wheeled two-animal cart. The shield is secured on top of the cradle.



The tube itself is carried on a cart with total load of 1,837 pounds. The top carriage load weighs 1,782 pounds, the lower (which uses its own wheels) 1,649. Narrow tracks are characteristic of Skoda pieces adapted to use in mountains.

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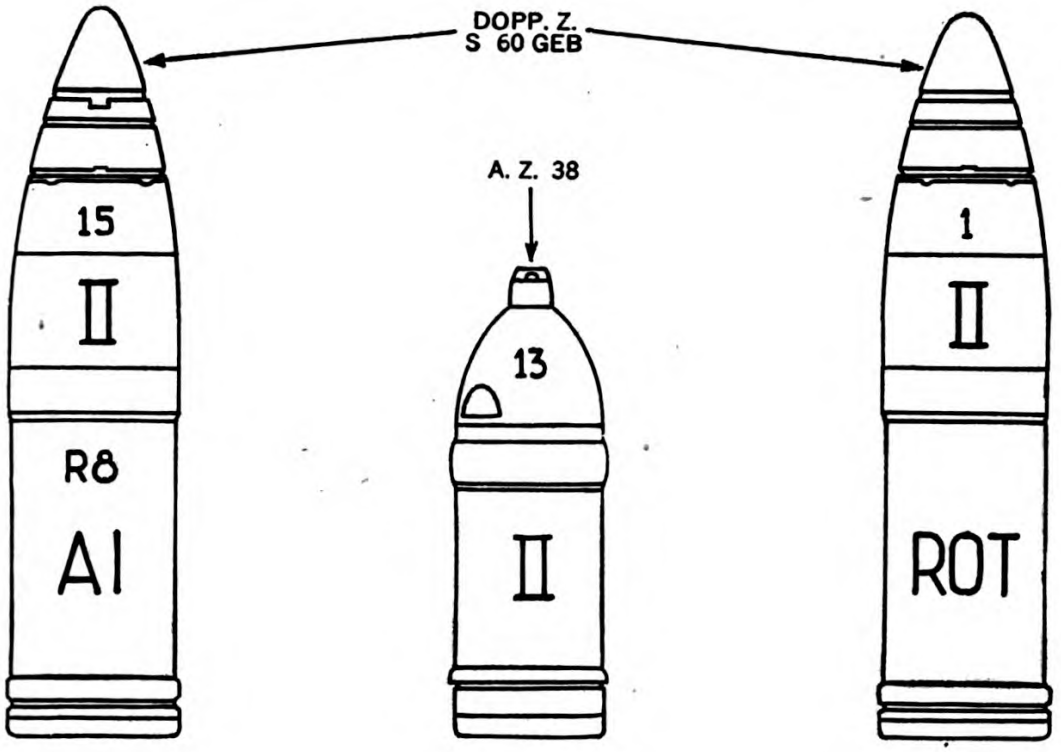


The original Italian 65-mm M1913 mountain gun (65/17) is available to the Germans in great quantities. It proved an unsatisfactory mountain gun in World War I because of light weight of shell. It is now the Italians' infantry cannon.



The above photo illustrates the use of two-wheeled carts to adapt field artillery for mountain travel. This Yugoslav column includes Skoda 76.5-mm field guns. The obsolete German light field gun *7.7 cm F. K. 96 n. A*, travels in three loads.

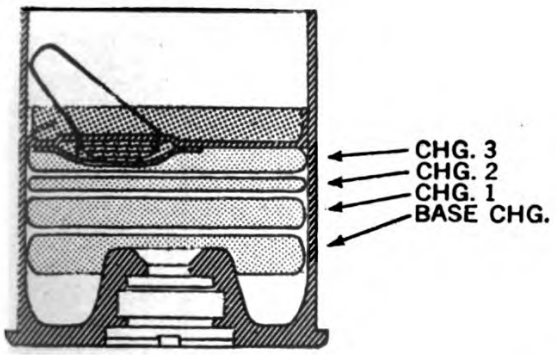
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12-POUND HE (GEB. GR. 15 AL) ALUMINUM SPOTTING COMPOUND

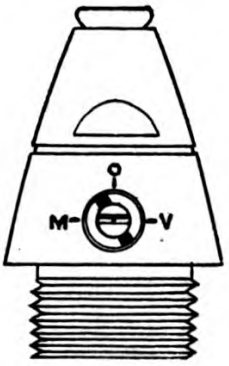
10-POUND HOLLOW CHARGE (7.5 CM GR. 39) FOR ANTITANK

12-POUND HE (GEB. GR. 15 ROT) RED SPOTTING COMPOUND



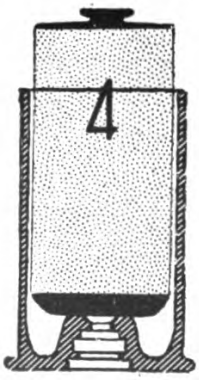
NORMAL CHARGE

If any charges are removed, replace the cardboard cup before firing.



TYPICAL DELAY FUZE

Fuze set for delay action. Turn set screw to vertical position for instantaneous action.



CHARGE 4

Packed separately and loaded in the ordinary cartridge case before firing.

GERMAN AMMUNITION FOR THE 75-mm GEB. K. 15

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EMERGENCY RANGE TABLE FOR THE *7.5 cm Geb. K. 15* FIRING HE SHELLS *Geb. Gr. 15 A1* AND *15 Rot*

AMMUNITION.—The *Geb. Gr. 15 A1* may be used with either the *Dopp. Z. S 60 Geb.* point-detonating quick and time fuse, or with the quick and .25-second delay fuze *A. Z. 23 Geb.* The *Geb. Gr. 15 Rot* uses only the *A. Z. 23 Geb.* The *A1* indicates compound which produces a grayish-white bursting cloud, the *Rot* a reddish cloud for sensing under difficult conditions.

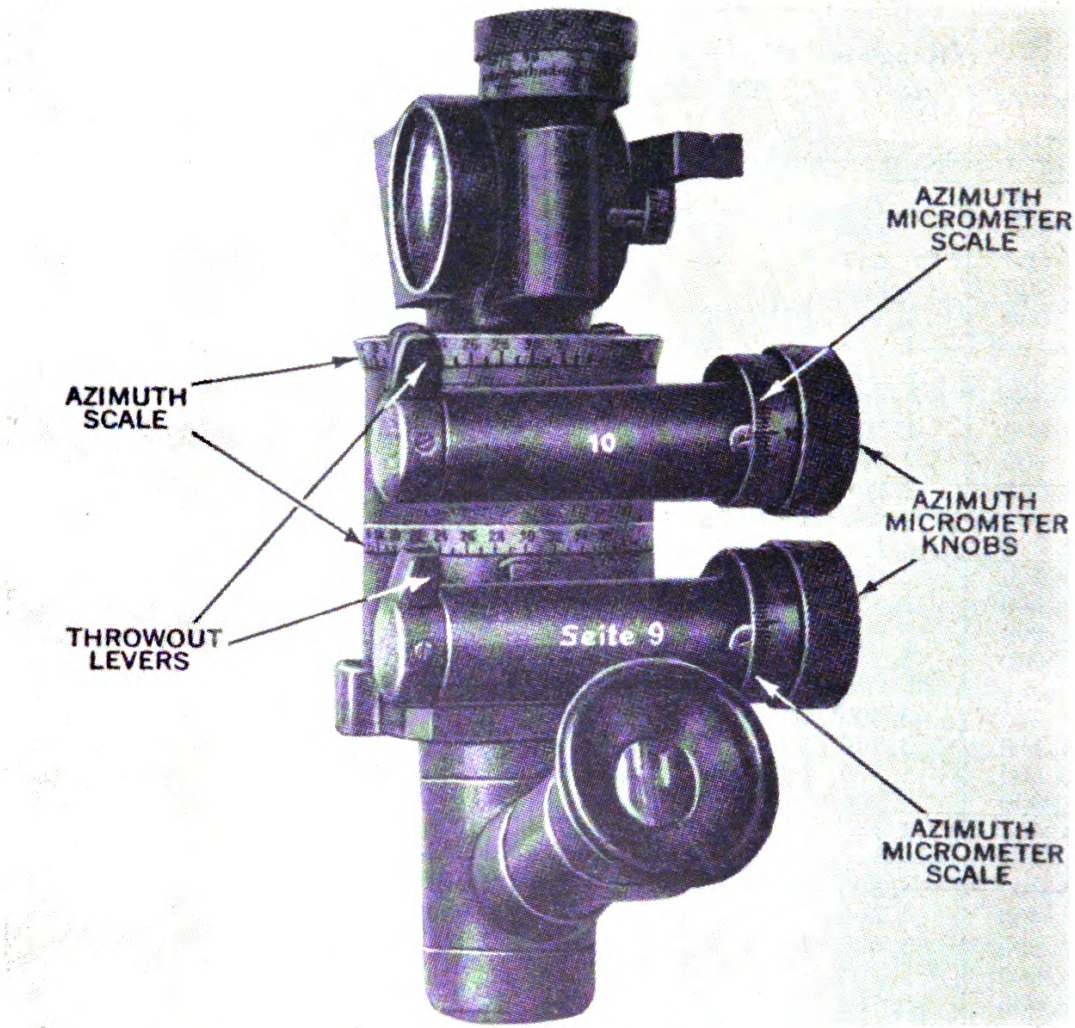
TIME SETTINGS.—Zero for the fuze is when the upper fuze groove is over the lower groove; for the fuze setter, zero on the scale. The scale is marked from 15 to 360 degrees. Fuse settings in the range table below are for the mountain time fuze *Dopp. Z. S/60 Geb.*

RANGE			CHARGE 1		CHARGE 2	
Range in meters	Range in yards (rough)	Range in yards (exact)	Elevation in mils	Fuze setting	Elevation in mils	Fuze setting
200	220	219	11	18	7	None
400	440	437	30	23	22	22
600	660	656	50	28	38	27
800	880	875	71	34	55	32
1,000	1,100	1,094	93	39	73	37
1,200	1,300	1,312	115	45	91	42
1,400	1,500	1,531	138	51	109	47
1,600	1,700	1,750	162	57	128	53
1,800	2,000	1,968	188	63	148	58
2,000	2,200	2,187	215	69	169	64
2,200	2,400	2,406	243	76	191	69
2,400	2,600	2,625	272	83	213	76
2,600	2,800	2,843	304	91	237	82
2,800	3,000	3,062	338	99	263	88
3,000	3,300	3,281	376	107	290	95
3,200	3,500	3,500	419	116	319	103
3,400	3,700	3,718	469	127	350	110
3,600	3,900	3,937	532	140	385	119
3,800	4,200	4,156	622	157	424	128
3,925	4,300	4,292	740	179	452	134
4,200	4,600	4,593	.....	.....	522	150
4,400	4,800	4,812	.....	.....	596	166
4,575	5,000	5,003	.....	.....	736	194

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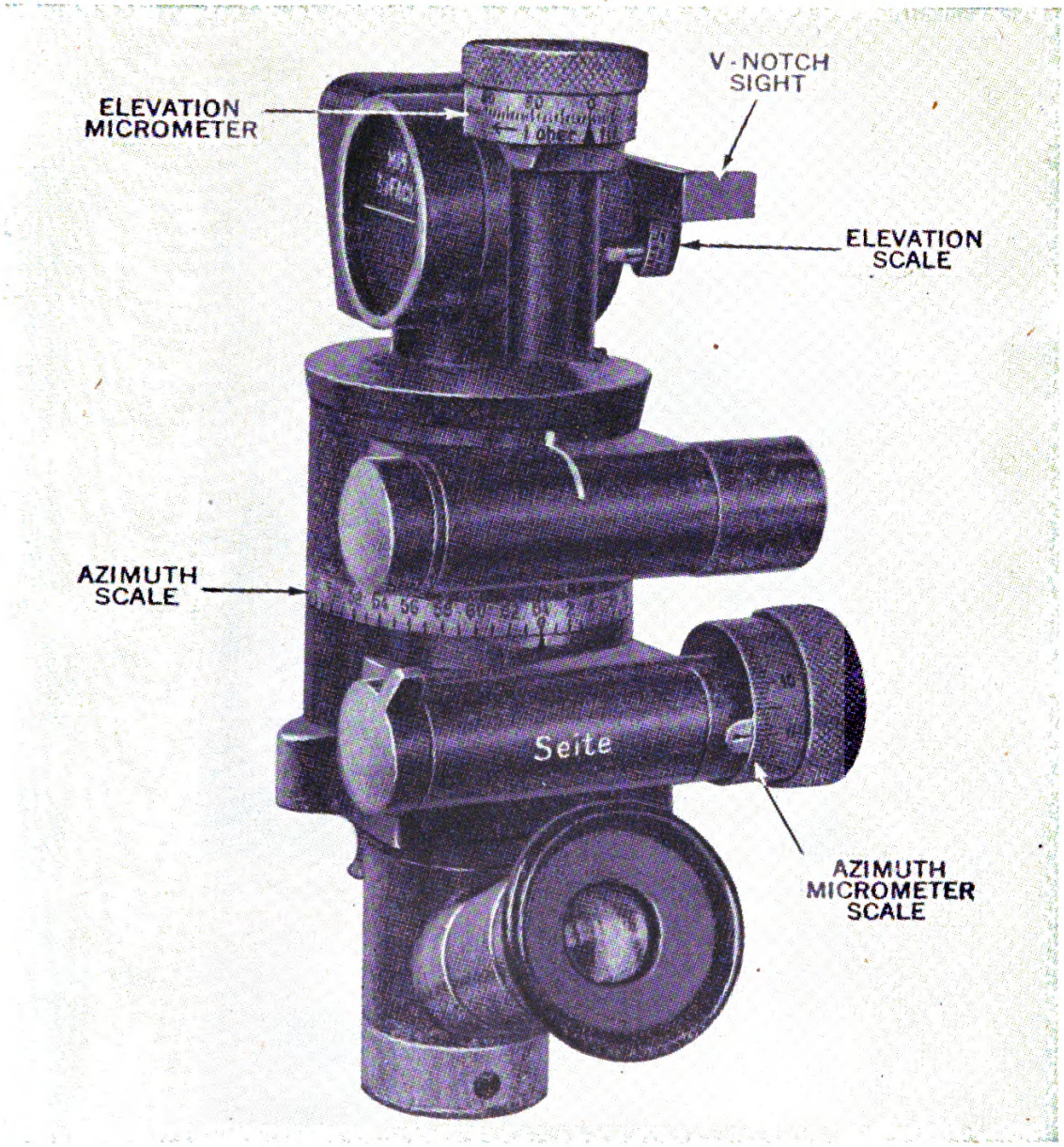
Range			Charge 3		Charge 4	
Range in meters	Range in yards (rough)	Range in yards (exact)	Elevation in mils	Fuze setting	Elevation in mils	Fuze setting
200	220	219	4	None	0	None
400	440	437	16	22	8	20
600	660	656	28	26	16	23
800	880	875	40	30	24	27
1,000	1,100	1,094	53	34	32	30
1,200	1,300	1,312	67	39	41	34
1,400	1,500	1,531	81	43	51	38
1,600	1,700	1,750	95	48	61	42
1,800	2,000	1,969	112	53	71	46
2,000	2,200	2,187	128	58	81	50
2,200	2,400	2,406	114	63	92	54
2,400	2,600	2,625	161	68	104	58
2,600	2,800	2,843	179	74	116	63
2,800	3,000	3,062	198	79	128	67
3,000	3,300	3,281	218	85	141	72
3,200	3,500	3,500	238	91	153	77
3,400	3,700	3,718	260	97	166	81
3,600	3,900	3,937	284	104	180	86
3,800	4,200	4,156	308	111	195	91
4,000	4,400	4,374	333	118	211	97
4,200	4,600	4,593	362	126	228	102
4,400	4,800	4,812	395	134	245	108
4,600	5,000	5,031	430	143	263	114
4,800	5,200	5,249	471	153	283	120
5,000	5,500	5,468	521	165	303	126
5,200	5,700	5,687	589	181	326	133
5,400	5,900	5,905	735	213	351	141
5,600	6,100	6,124	.....	.....	380	149
5,800	6,300	6,343	.....	.....	412	158
6,000	6,600	6,561	.....	.....	450	169
6,200	6,800	6,780	.....	.....	494	181
6,400	7,000	6,999	.....	.....	547	195
6,600	7,200	7,218	.....	.....	629	216
6,650	.....	7,273	.....	.....	677	227

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The two types of panoramic telescopes for the *Geb. K. 15* are both marked *M 15 3.3 FACH* (3.3 power). That above is the earlier type. Its two azimuth scales are each marked in hundreds of mils from 0 to 6400. Each scale has a micrometer knob and scale marked from 0 to 100 mils. Each micrometer scale has a throwout lever located on the end of the worm-gear housing opposite the micrometer knob. To set deflection, set both azimuth scales at 3200 (parallel to the bore of the gun tube). Base deflection is then set on the power azimuth and micrometer scales (marked *Seite 9* on the gear housing). Changes of deflection are set on the upper scales (marked *10*).

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The newer type of panoramic telescope for the *Geb. K. 15* is similar to the earlier type, except for the fact that the upper azimuth and micrometer scales are inoperative, and the lower azimuth scale set so that 6400/0 mils setting is parallel with the axis of the gun tube. This view of the telescope shows the scope head with V-notch for rough sight, and below the notch the elevation indicator. Zero elevation (site 300) is marked *3* in red. Elevations above 300 are in red; those below, in black. The figure *5* stands for 500 mils, *1* for 100 mils. The elevation micrometer scale top the scope is in mils from 0 to 100. Turn it clockwise to elevate.

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Air Force mountain signal troops repair air-raid warning net telephone lines.



A skier in white surcoat lays wire in the Caucasus from a back-packed reel.

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COMMUNICATIONS

While the Germans employ telephone and radio equipment as their primary means of communication in mountain operations, they appreciate the difficulties which make these means considerably less effective than in the flat. Altitude, weather conditions, forests, rock masses, and the difficulties of laying and recovering wire, and of transporting signal equipment in rugged terrain impose definite limitations on normal communication methods. Consequently the Germans have designed some light-weight signal equipment for mountain troops, and have developed auxiliary means—heliograph, blinker, semaphore, and messenger dogs to the limit of their possibilities. Carrier pigeons are employed only if they are not likely to be attacked by birds of prey.

In the early part of the war, German mountain signal troops were handicapped by having to use the relatively heavy, portable radio set designated *Torn. Fu. d2.* Carried in two loads, this 78-pound set has a voice range of about 2 miles and a key range of 10 miles. As regards general efficiency of design, this set is definitely inferior to contemporary U. S. portable radios. It has been largely replaced by lighter, one-man load radios, such as the 29-pound *Feldfunk Sprecher b* and *c.* Although revealing considerable improvement over the heavy *Torn. Fu. d2,* the newer radios are still less efficient than U. S. counterparts.

Telephone equipment consists of the standard switchboards and dial phones employed by other signal troops. However, pack animals are provided with saddles so designed that wire may be laid or recovered from reels secured to the saddles.

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The near mule of this mountain signal pack train carries a ten-line switchboard. The mule next ahead carries two reels of wire on each side of its pack saddle. On top of saddle it bears a reel of wire on a reel packboard. Men wear this packboard on chest when winding in wire, transfer packboard to the back when they are paying out.

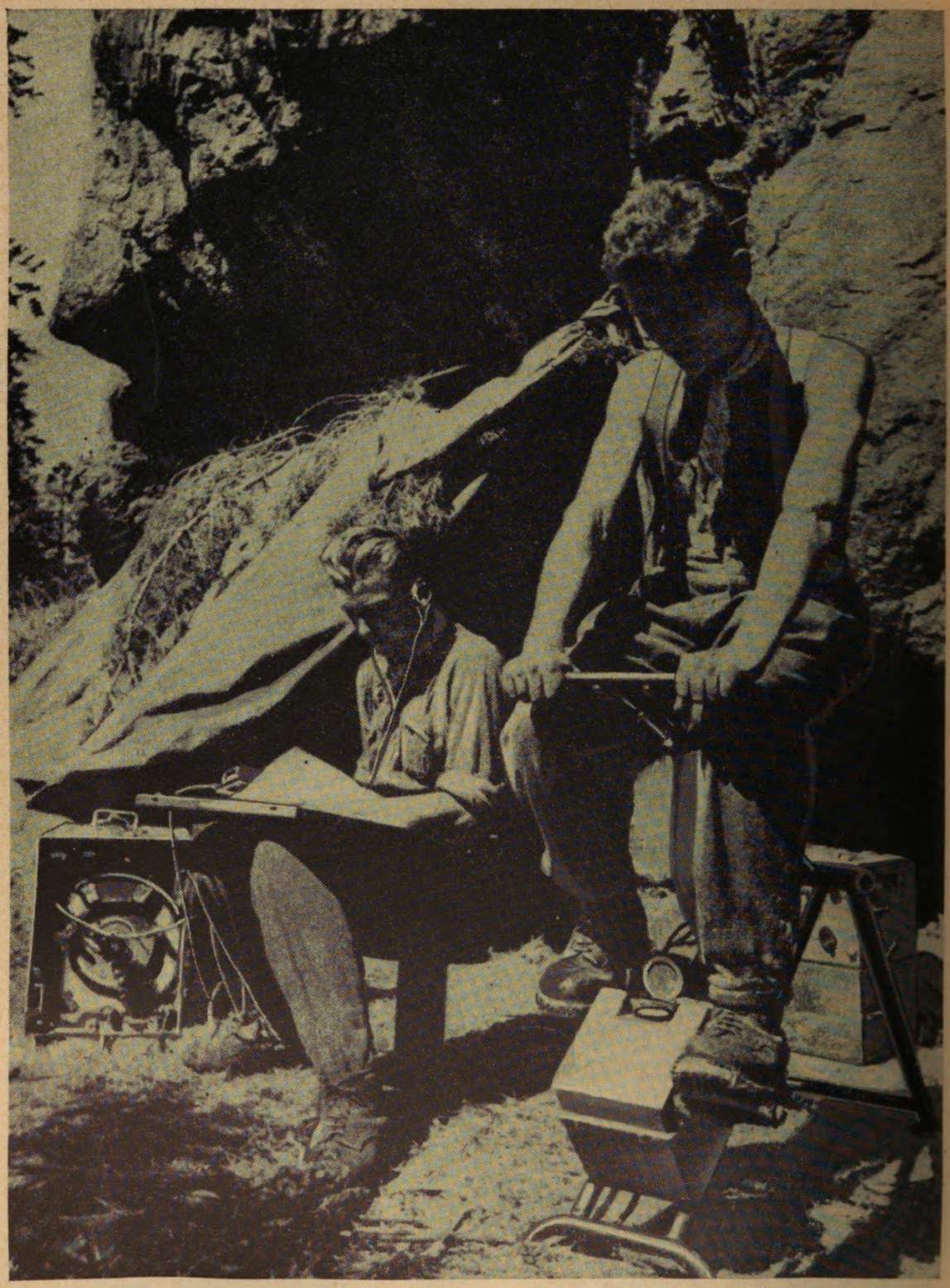
Since the outbreak of war German portable radio sets have been redesigned to make one-man loads instead of two-man loads. The man at the left carries one of new models (*Feldfu b*); the man with the message blank wears earphones and has a microphone. Remote control units are furnished with German portable radio sets.

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This mountain ski patrol carries a *Tornister Funkgerät d2*. The near man carries the transmitter-receiver unit, the next man the power supply and frequency calibrator. Part of the pole aerial shows above near man's left arm.

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This foot-operated generator to supply power for radio equipment was designed before the war for the German forestry service by *Telefunken* (a commercial firm). Its high silhouette and noisy mechanism limit its military value.

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A mountain message center is concealed in evergreens. The tent sections of the crew are combined to form a shelter. The equipment shown consists of the radio *Torn. Fu. d2* and telephones. This photograph was taken during maneuvers.

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A white letter "F" on a red field designates a German message center.

An acting mountain corporal prepares messages to be carried by dogs.



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A mountain soldier uses semaphore to communicate from one Caucasian mountain peak to another. In rugged terrain which assault troops can climb only with minimum loads, communication equipment often is limited to semaphore flags.

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The sack shown above is a 4-pound, water-repellent carrier for evacuating casualties. A casualty is being roped down a cliff. The keyhole-shaped objects are brakes, which function to slow or stop the roping-down process.

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EVACUATION

The Germans regard evacuation problems in mountains as sufficiently complex to require development and provision of much special medical equipment and specially-trained medical personnel. Mountain medical troops are able to handle both battle casualties and those resulting from mountaineering accidents, which may cause severe injuries. Ordinary mountaineers are forbidden to attempt any treatment other than first aid. Instead they summon medical rescue parties by prearranged signals. Besides treating rock injury cases, medical personnel are prepared to treat ills common to the mountains—frostbite, altitude sickness, glacial sunburn, snow blindness, and injuries caused by lightning, avalanches, and falling rocks.

The special medical equipment issued to mountain troops includes the sack illustrated at the left. It may be carried by six men, each holding one of the handles; by three men holding sticks run through pairs of handles; or by two men using long poles inserted longitudinally through the handles on both sides. The sack is 78 inches long and 20 inches wide.

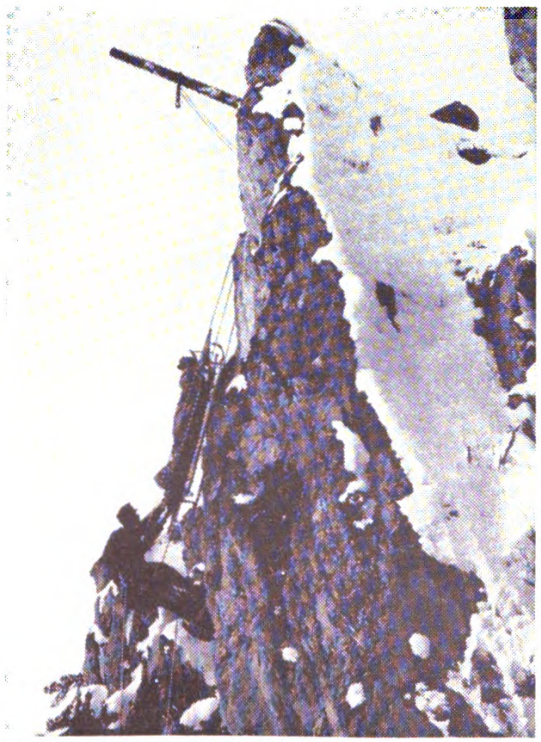
Illustrated on the page at the left are metal rings to which the ropes holding the stretcher are attached. These are a safety snubbing device, used by medical personnel in roping down casualties either when using the sack or when using the sling and rucksack seat (page 120). These snubbers permit bringing the load to a full stop. (They are also used to rope down freight.)

Another type of sack-like carrier (not illustrated) is used when casualties must be towed by single skiers.

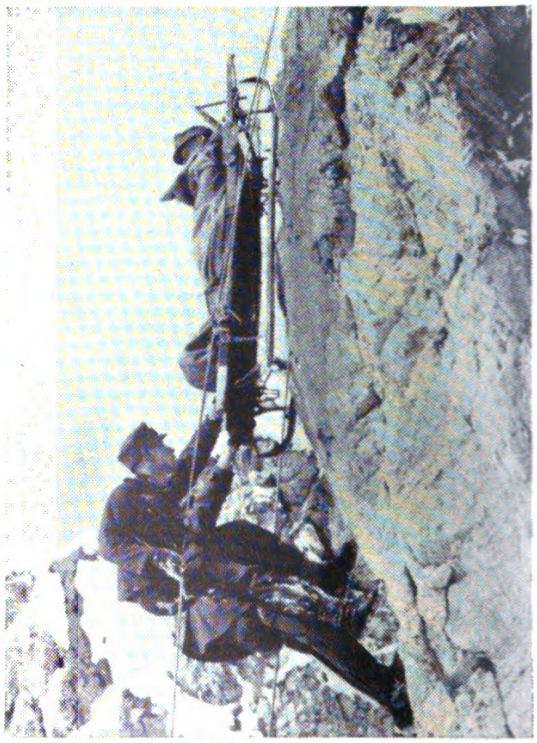
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The men at the left are ready to guide down a simulated casualty on a ski stretcher. They have arranged their ropes to rope down in a normal manner. The third man has job of belaying the ropes on which the stretcher descends.

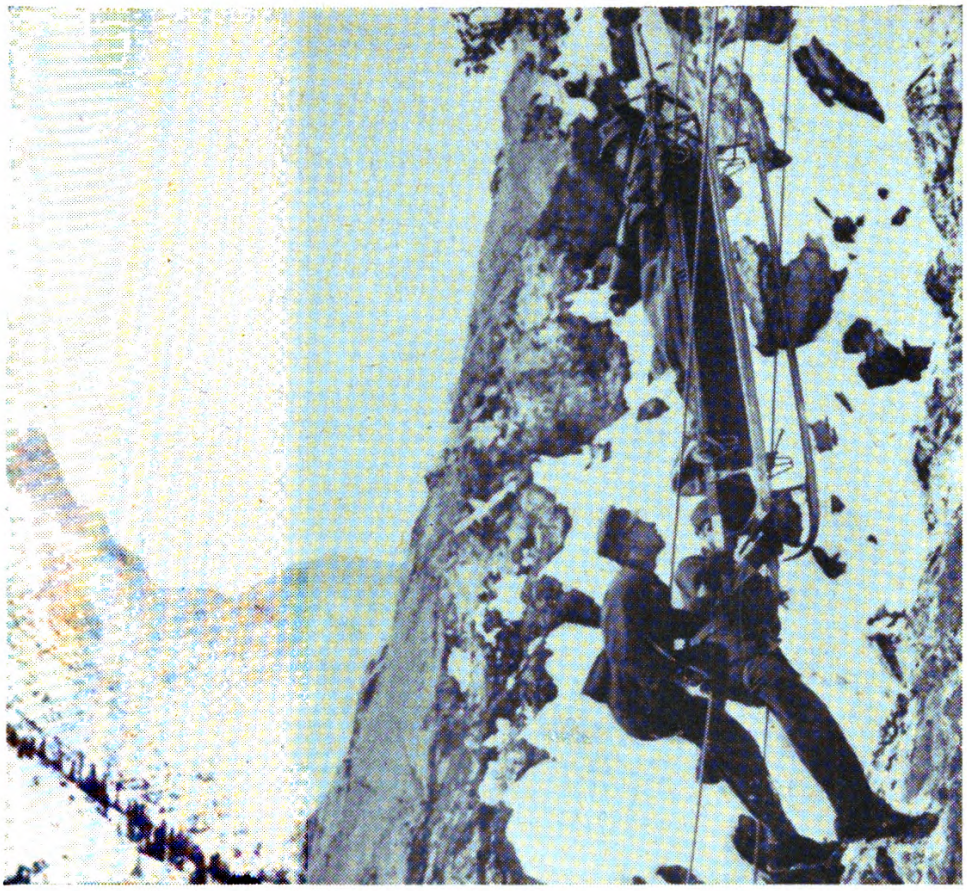


The sergeant and private prevent the stretcher from swinging and jolting.



By proper guiding, the stretcher is made to slip down a rock overhang.

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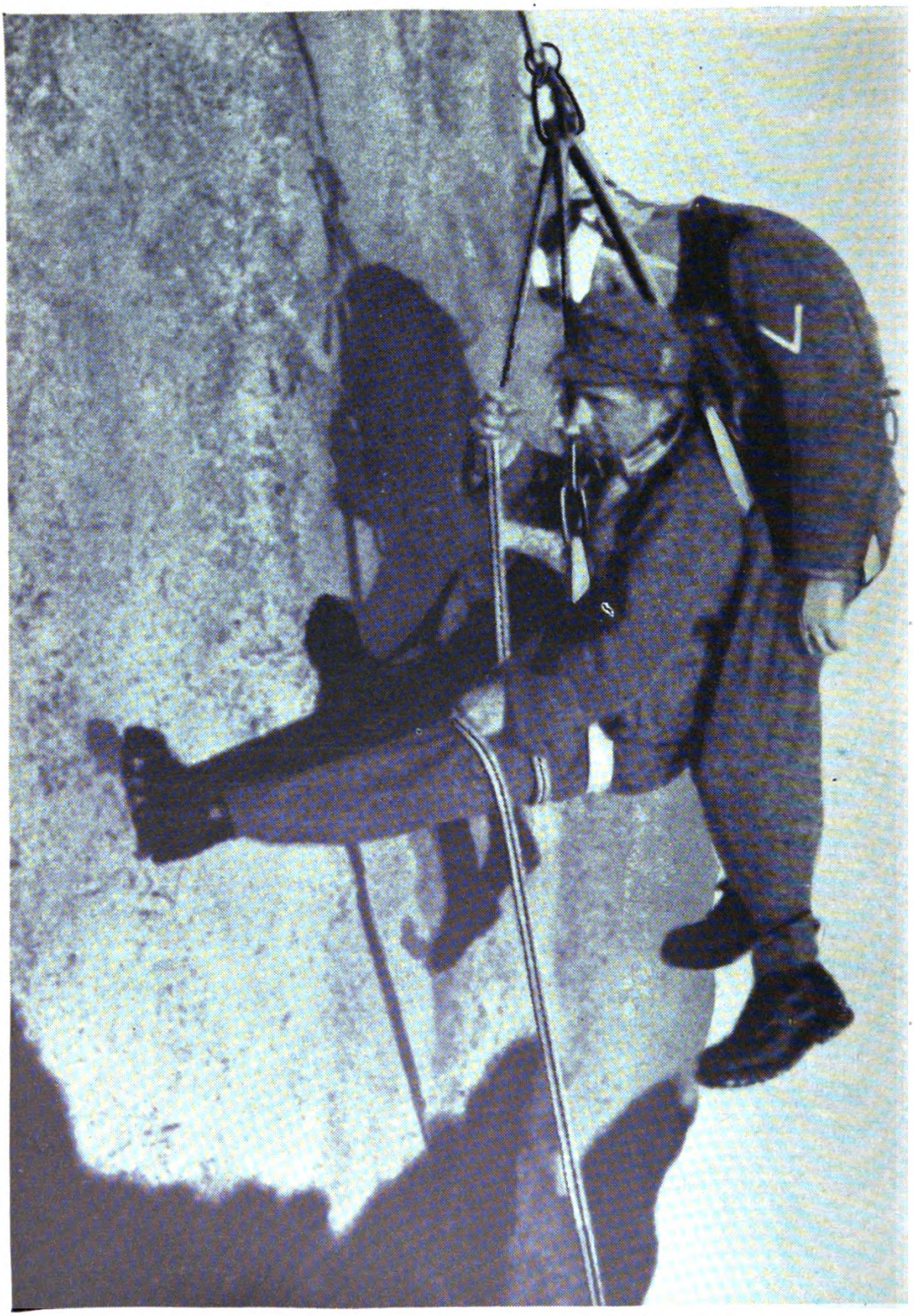


On descending past the rock overhang, stretcher hangs comparatively free and causes difficulty for the personnel guiding it.



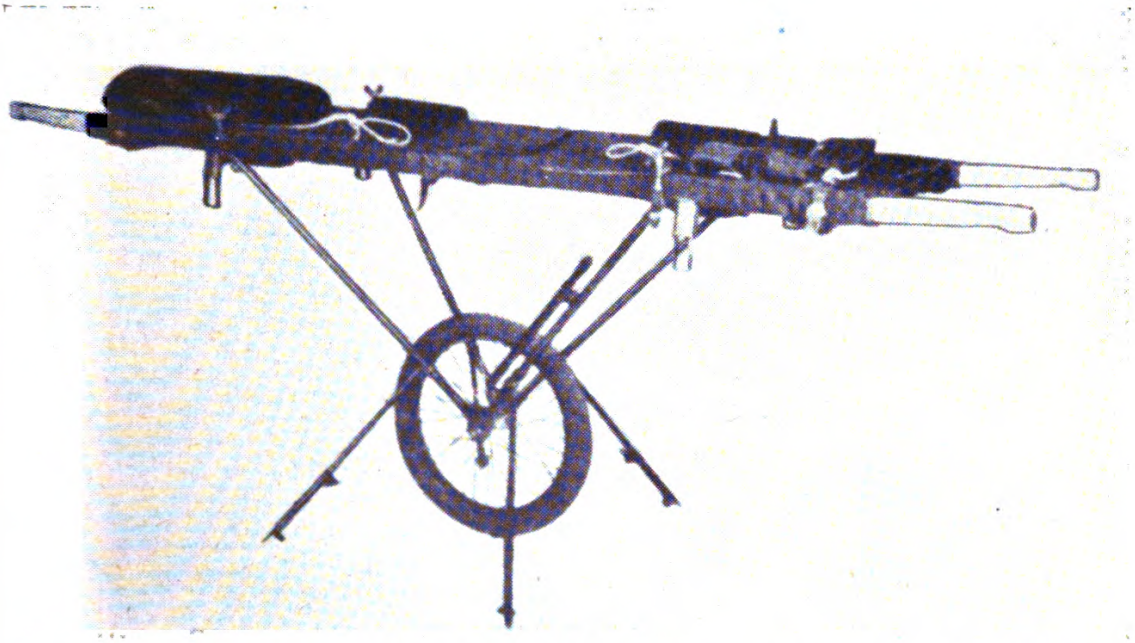
An improvised tramway consists of stretcher hung from ropes attached to snaplinks, which run along the tramway rope and have pull ropes secured to them.

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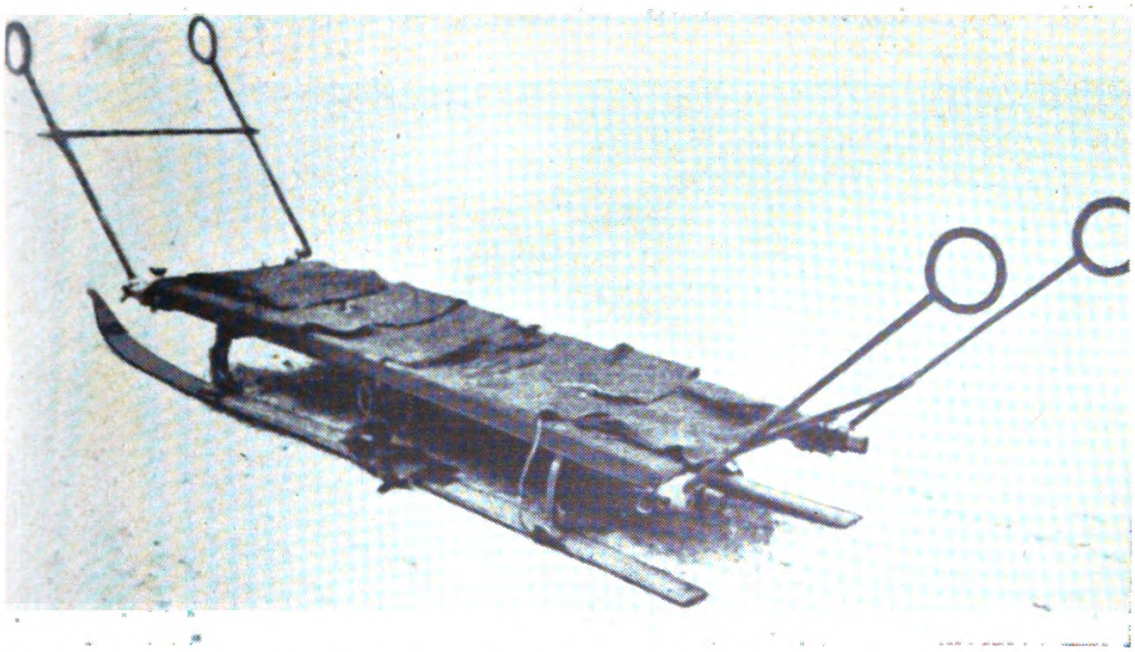


Carrying and roping-down equipment for evacuation includes the rucksack seat for back carry (above) and slings to hold patient and carrier in roping down. To permit slow descent, slings are secured to safety snubbers (page 116).

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The unicycle mountain stretcher is designed for narrow mountain trails. It has a collapsible stand for emergency operations. Weighing 25 pounds, it is carried in two parts, the wheel fitting on outside of the ordinary rucksack.



The light ski stretcher is similar to the army's standard stretcher except for two ski-type runners and two sets of steering rings to be held by two skiers, one standing between the front pair of rings, the other between the rear.

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Dogs of the St. Bernard breed are used by mountain medical units. This dog carries medical equipment and a canteen.



The mountain tent for operations is higher at the sides than the ward type. It consists of two halves tied together, and its total weight is 211 pounds.

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Static positions are provided with well-protected dugouts. The stretcher bearers are wearing surcoats over their overcoats.

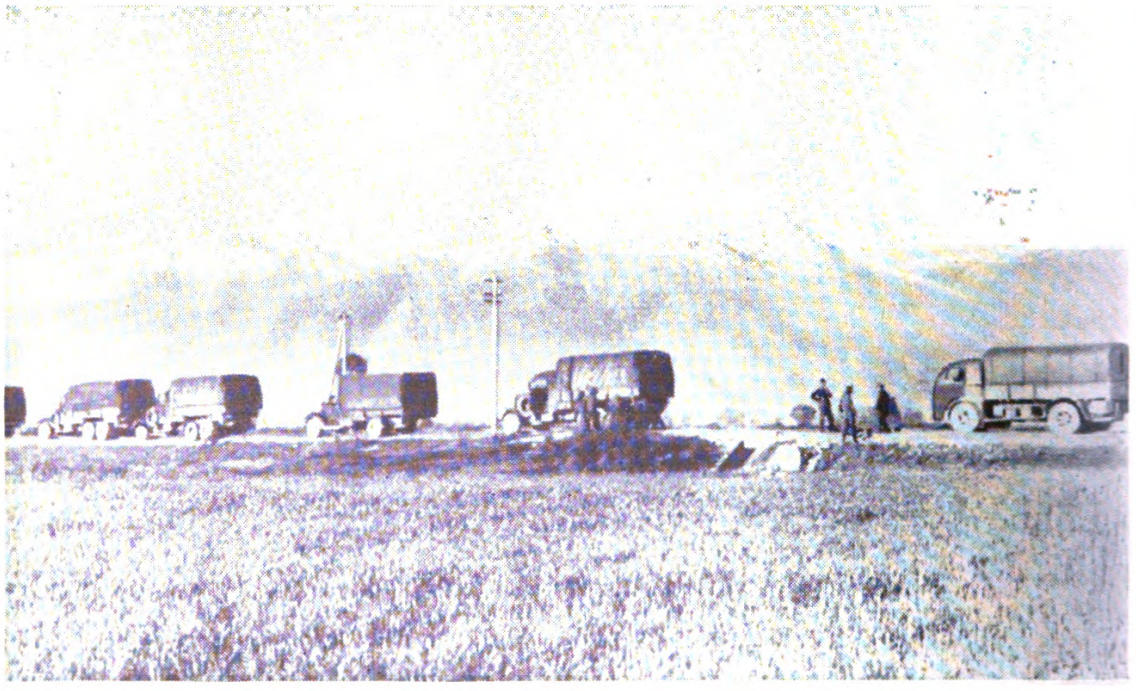


The mountain hospital ward tent has a length of 16½ feet and a height at sides of 3 feet. Breaking down into two pack loads, it weighs 176 pounds.

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The 12-foot long amphibious *Schwimmwagen* (*le. Pkw. K2s.*) can carry 4 passengers or a 990-pound useful load. It may be used for reconnaissance and supply.



German motor columns are sent as far into mountains as roads permit. This column of trucks in the 1941 Balkan Campaign shows the variety of types used.

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SUPPLY

The Germans consider supply one of the most vital elements of mountain warfare. They have painstakingly constructed roads and tracks and developed numerous means of supply for mountain troops. Motor vehicles, men, animals, and airborne devices are used to supply combat units.

Trucks serve where the roads permit. When they can go no farther,



The 1¼-ton *Kettenkrad* is efficient in mud. Like the German amphibious jeep, it can also be employed as a light prime mover or as a reconnaissance vehicle.

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loads are transferred to the 1¼-ton *Kettenkrad* (a half-tracked motorcycle) and its trailer, which have proved to be useful in mud and over difficult terrain. Though as mechanically unreliable as the *Volkswagen* on which it is based, the *Schwimmwagen* has proved useful. Its sprocket and chain driven propeller unit folds up atop the rear for land travel.

When motor transport becomes impracticable, cargo is broken down into loads for horse-drawn carts. These are light two-wheeled vehicles, which may even be drawn by men when the situation requires. A second cart, with shafts removed, often is attached in tandem to form a dual unit. In this arrangement, the horses are also in tandem. This permits one man to lead the horses, and frees the second horse leader so that he can guide the carts over obstructions on mountain trails, and brake them when descending slopes.

Pack animals usually are reserved for transport over more difficult terrain, although they may move simultaneously on roads with wheeled vehicles. The preferred pack animal is the mule. Horses are considered less desirable, as they lack stamina, but some, specially bred, are employed. Some mountain units have used white horses in violation of the principles of camouflage, except when they have been used in snowy terrain. Theoretically, loads are restricted to 300 pounds, but there is evidence that over-loading up to 350 pounds is not uncommon. Muleteers guiding loaded pack animals carry their own rucksacks. When mules are without loads, muleteers may place their rucksacks and other gear on the animals' backs.

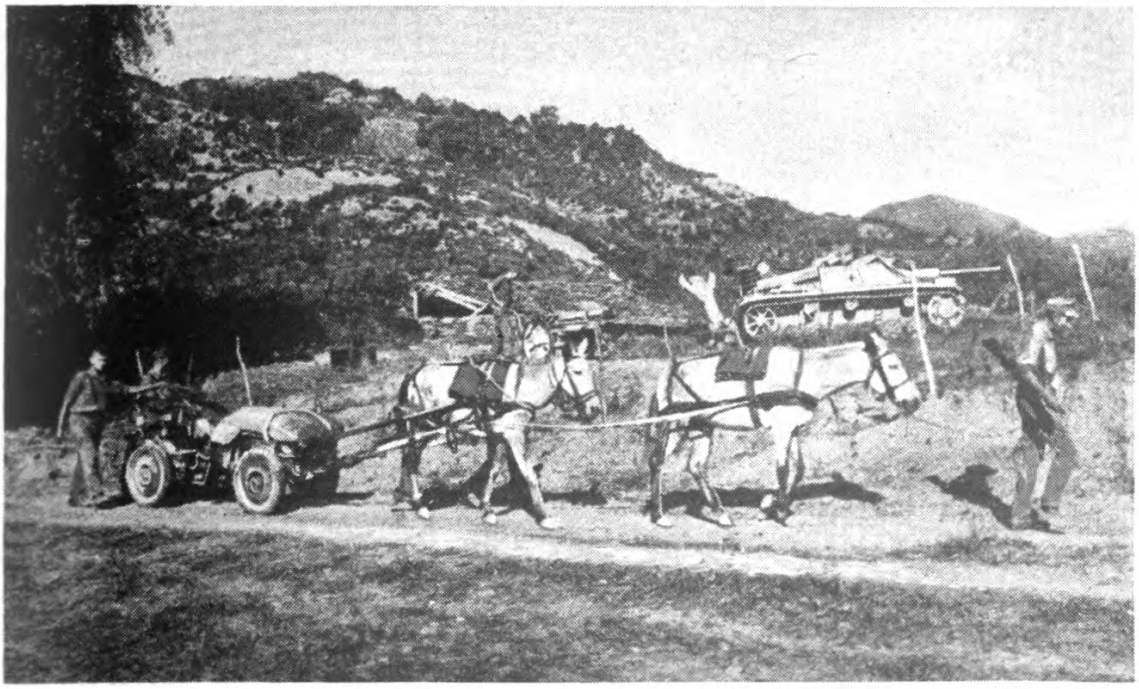
The final stages of supply may require manpower to reach otherwise inaccessible destinations. Loads are carried on packboards common to mountaineers all over the world. The average load of a German soldier is 60 pounds, but in emergencies it may be increased to the limit of the individual's capacity.

These standard means of supply may be supplemented by aerial tramways, by the use of booms, block and tackle, and by airborne supplies dropped in various types of parachute-fitted containers. Since the beginning of the war the Germans have devoted increasing attention to the use of dogs as supply carriers. Dogs can complete their missions in terrain which is impassable for other animals and can find their way without human guides through rough country and bad weather. However, they can carry only light loads such as canteens, small-arms ammunition, loaded machine-gun belts, food, and medical supplies.

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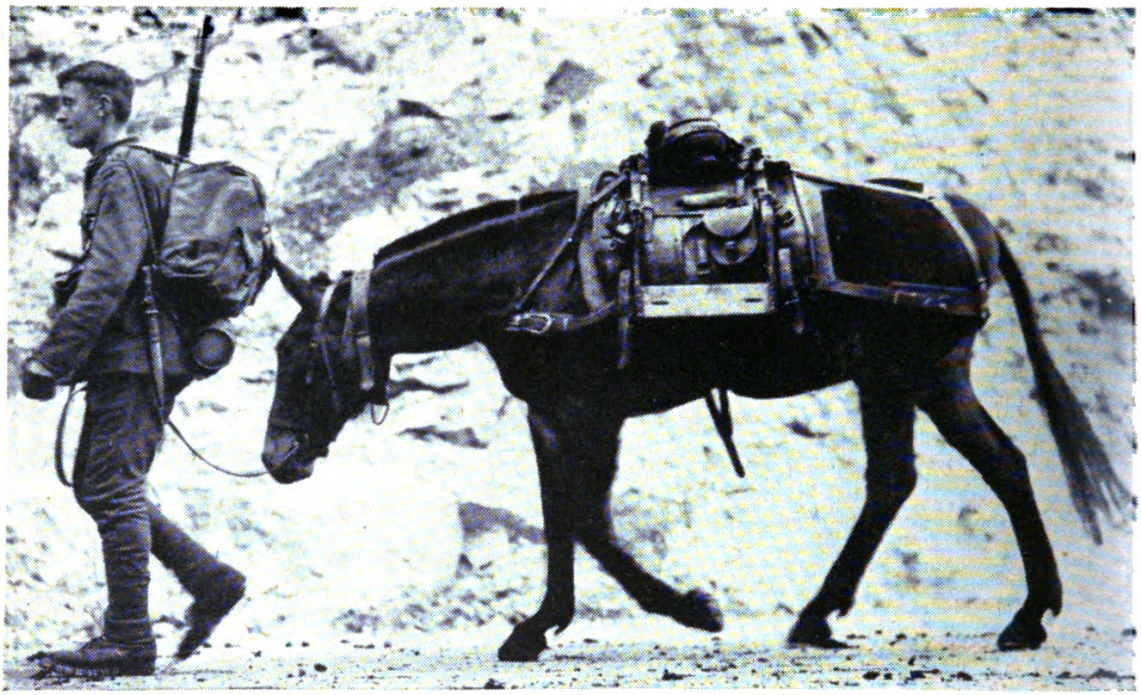


Four-wheeled, two-horse carts are a basic type of road transport for supply of mountain divisions. This supply train was photographed in Greece in 1941.



The two-wheeled horse- or man-drawn cart (two of which are shown above) may be joined in twos, the horses and carts in tandem, to permit driving by one man.

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This old photograph (dated by the muleteer's tight trousers) illustrates the basic type of German pack saddle, large numbers of which are still in use.



Specially designed covers are furnished for many pack loads. Such covers are usually for specific equipment. Muleteers must carry rifles as shown here.

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Wicker panniers are standard for carrying general supplies. These troops are on prewar Bavarian maneuvers. Rifles should be slung across the men's chests.



Wicker panniers are wide and may be padlocked. Compare this rifle, the long *Kar. 98b,* with the M98 of the white-uniformed soldier on the opposite page.

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A pannier-loaded pack train marches across a Caucasian valley. The column is bunched and makes a good target, thereby violating German training doctrine.



This dog carries a loaded machine-gun belt, a strapped-on canteen, and medical supplies.

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A Luftwaffe mountain signal private (without mountain cap) carries a keg of beer, a cushion, and other items on a wooden packboard. He wears snowshoes of the European type and carries a ski pole instead of an ice ax for a cane.

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Mountain artillerymen climb a prepared route consisting of snow steps and a hand line fixed to a rock wall. Ordinary mountain troops, probably supervised by a guide who selected the route, very likely constructed the steps.

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PREPARED ROUTES

The problem of movement being paramount in the difficult terrain in which mountain troops operate, the Germans particularly emphasize the training of guides and engineers in preparing routes for an advance. Such routes may range from those for highly skilled rock climbers to motor roads and tracks for non-mountain soldiers. The basic principles of route selection and construction are also taught to ordinary mountain units.



This route in the Caucasus consists of steps cut in the ice (left); over them is placed a rope ladder (foreground) for footholds. Above the steps is a shelf dug in the snow and a rope so secured as to provide handholds.

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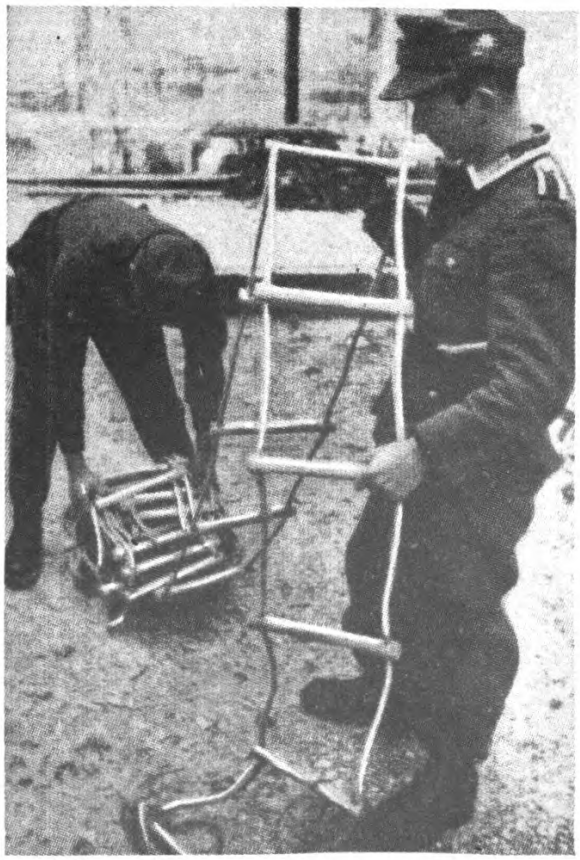


A mountain guide ascends a makeshift rope ladder during training in Bavaria. The ladder is improvised from available rope and rungs from near-by timber.

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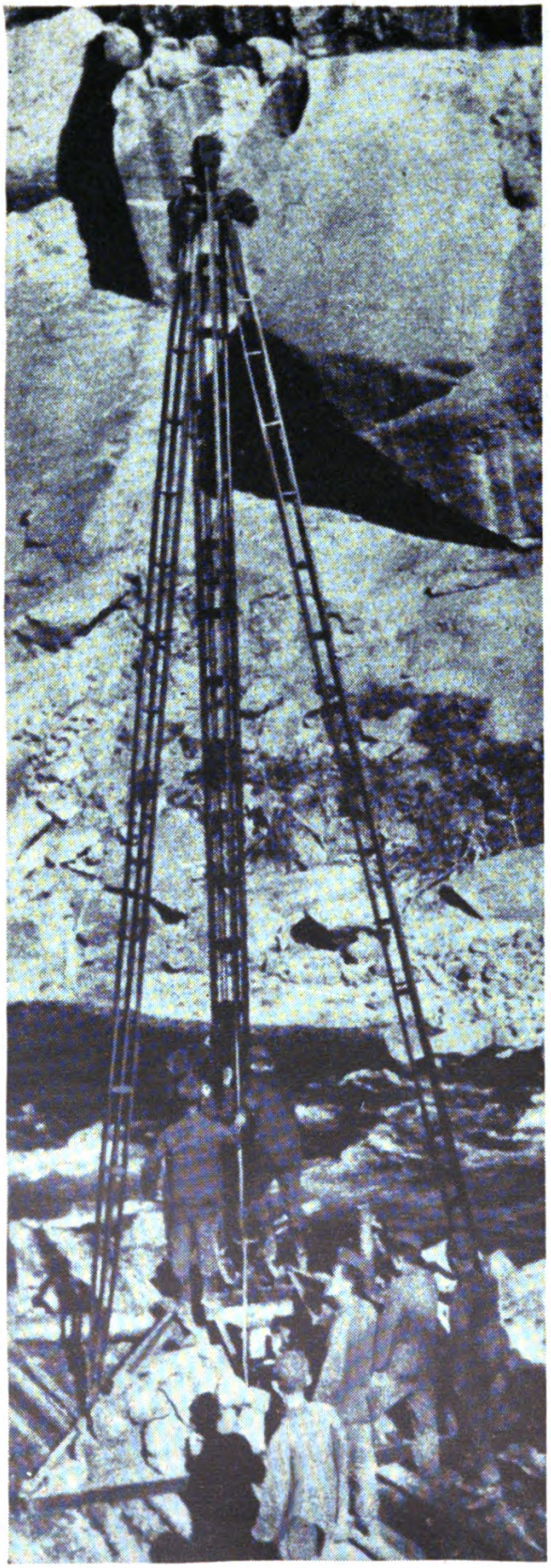


Rope ladders with rope rungs are hard to climb. They must be secured by bracing lines to prevent twisting. This detail shows an improvised ladder.



Considered more satisfactory are rope ladders with wooden rungs. They do not twist, but they are bulky and may encumber troops on missions that necessitate difficult climbing.

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A detail of the pile driver used in the picture at left indicates that it is pneumatically operated. The clamps indicate that it is probably the 200-m/kg pneumatic type.

For road building in mountains Germans have available several models of light pile drivers. Five of them can be operated on the pile-driving frame M39, shown being erected to drive piles for a motor bridge in a Caucasian valley.

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Typical of tasks performed by German mountaineers in the Caucasus is this route prepared for ordinary troops. Rungs have been fixed in the rock face.

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AERIAL TRAMWAYS

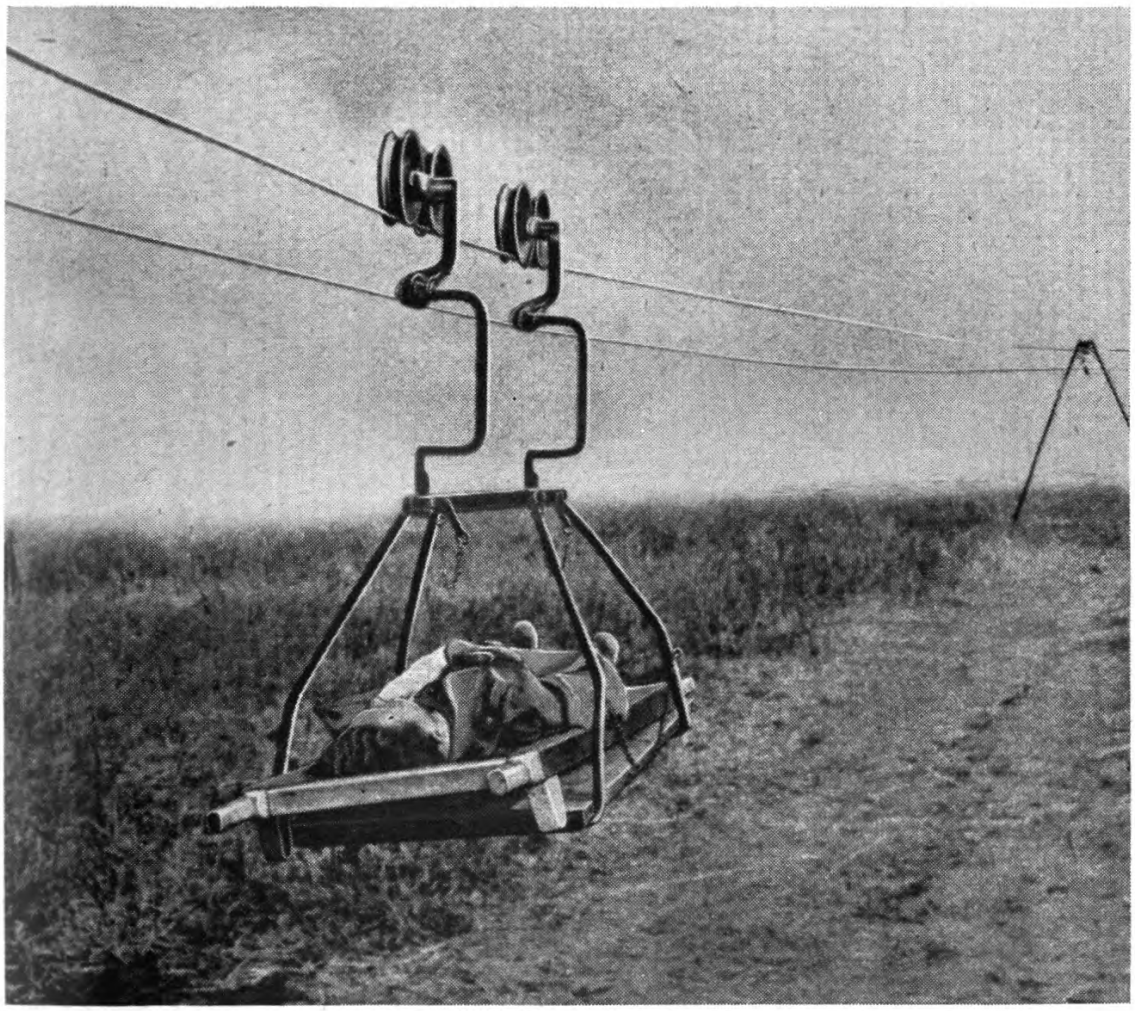
There is a wide variety of German aerial tramways (funiculars), varying from improvised types to those requiring heavy foundations and large shelters for the machinery at either end.

Aerial tramways are used to transport supplies and personnel, and to assist in evacuation of casualties. Tramways are used to move loads up steep slopes, especially those which are subject to avalanches and therefore dangerous to pack trains. Block and tackle is used instead of tramways on vertical cliffs. Tramways also are erected when it is impractical to bring in heavy equipment to bridge a gorge, marsh, or mountain stream.



In preparing a light tramway, a light line and a rocket projector are carried to the desired terminus on the heights. Projected into the valley, the line serves as a medium by which tramway gear may be hauled to the top. A few hours usually suffice for the completion of light aerial tramways.

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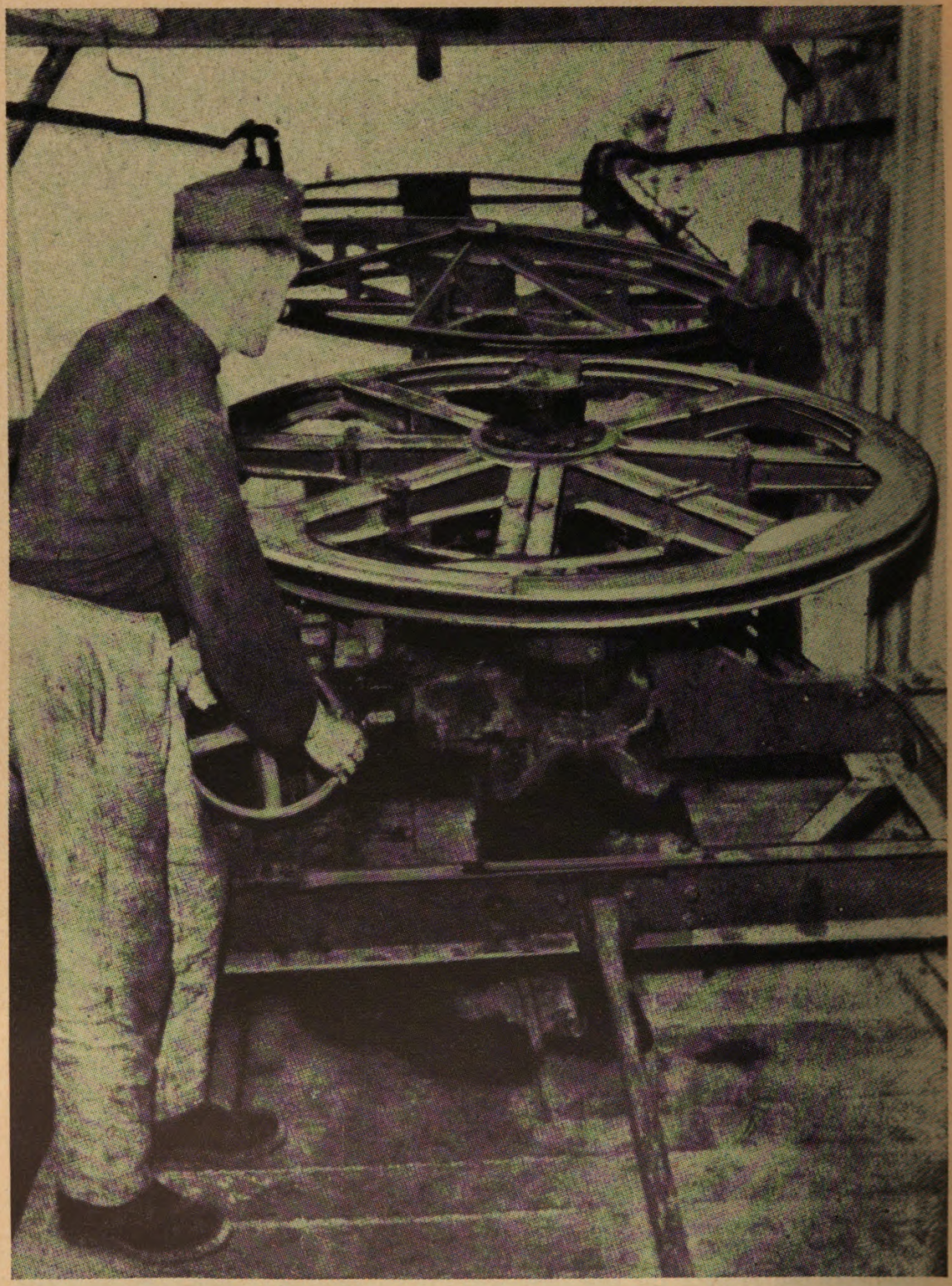


A casualty is evacuated across the Kuban Marshes. Tramways also have been used by mountain troops in the Pripet Marshes.



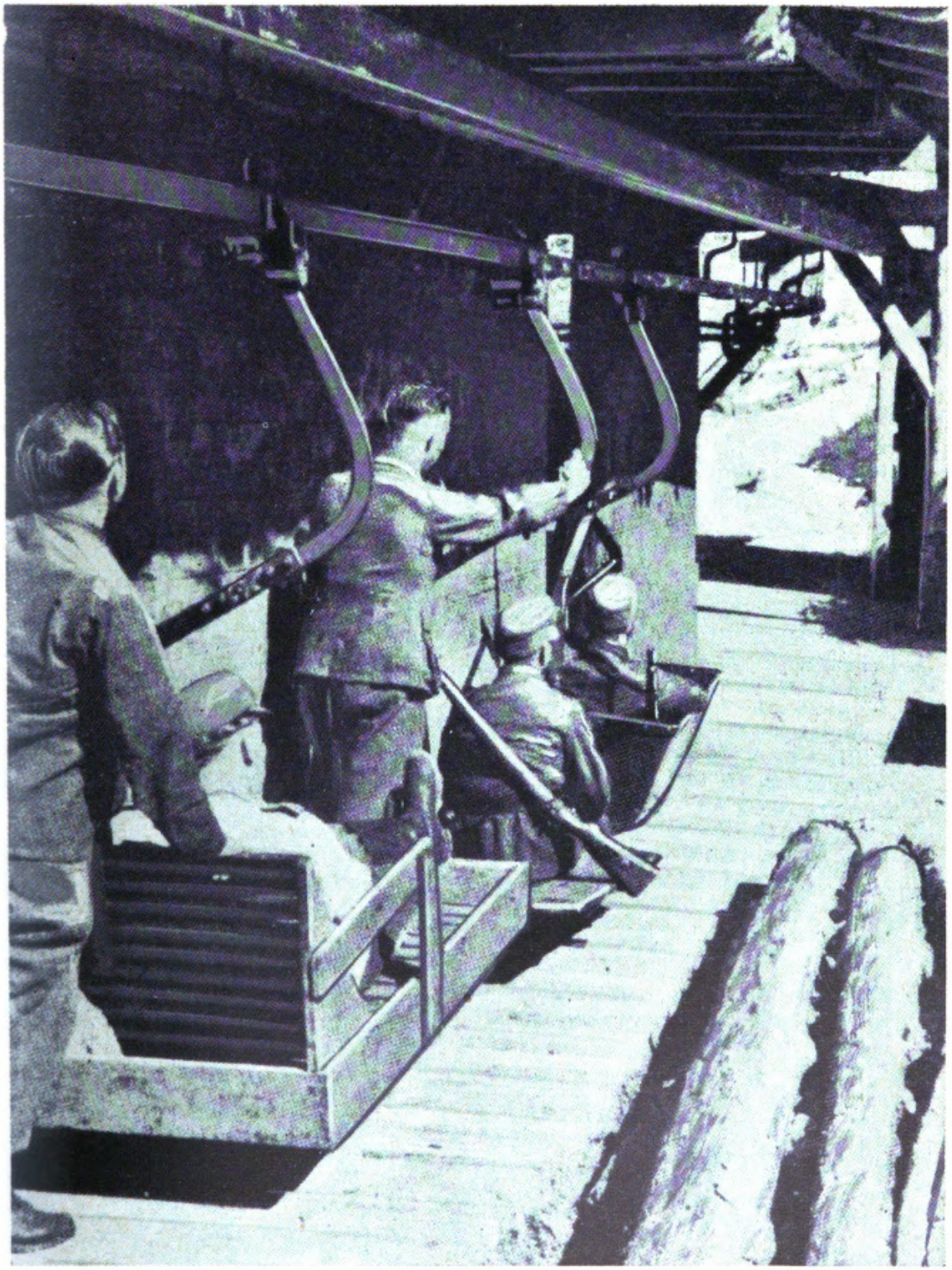
Mountain troops ride a tramway car across a Caucasian mountain gorge. In this case, a tramway has been used as a temporary means of transport until engineers can replace the destroyed road and bridge which can be seen in the background.

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These spools at a large tramway terminus control the movement of the tramway cars. Both spools and the steel framework on which they are based are bolted together, thus permitting disassembly into small loads for pack transport.

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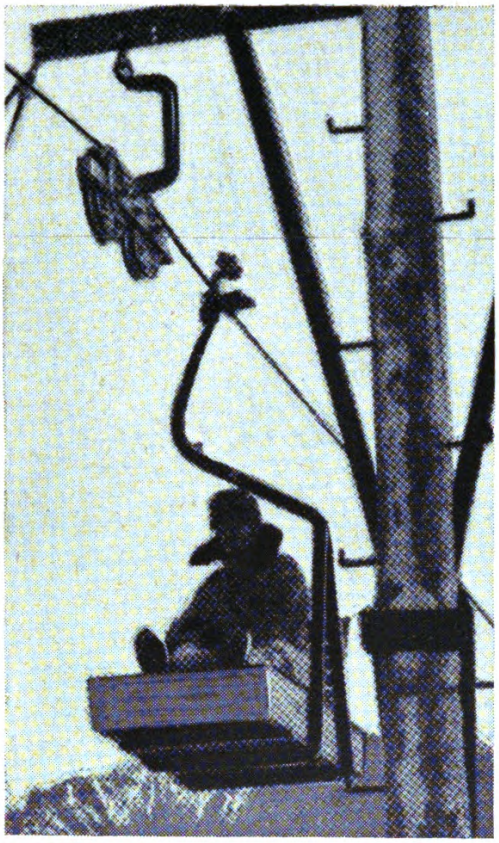


Varied types of carriers rest in this tramway terminus in north Norway. The improvised carrier with backrest is for casualties, the bucket seat for personnel, and the bucket for supplies. The station's spools are shown opposite.

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Tramways of great length are sustained by intermediate suspension points. A casualty is being evacuated on the same type of car as that shown on p. 141.

Intermediate suspension points also may be used as stations for unloading cargo and personnel. This aerial tramway is shown in the Caucasus Mountains.



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Terminus gear of light tramways may be very light and compact, as indicated by comparison of the spool at right and tramway spools on page 140. Fir logs are brought from the valley below for building shelters and fortifications.

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BRIDGING

German mountain engineers are trained to build bridges with locally available materials, whenever possible, using light-weight power saws and pile drivers. Thus they avoid necessity of transporting prepared bridges along narrow mountain roads; planking is usually the only material that must be trucked into the zone of operations. Ponton bridges are not normally included in the equipment of mountain divisions or corps, but when supplied they can be used, since many mountain engineers are experienced in handling them.



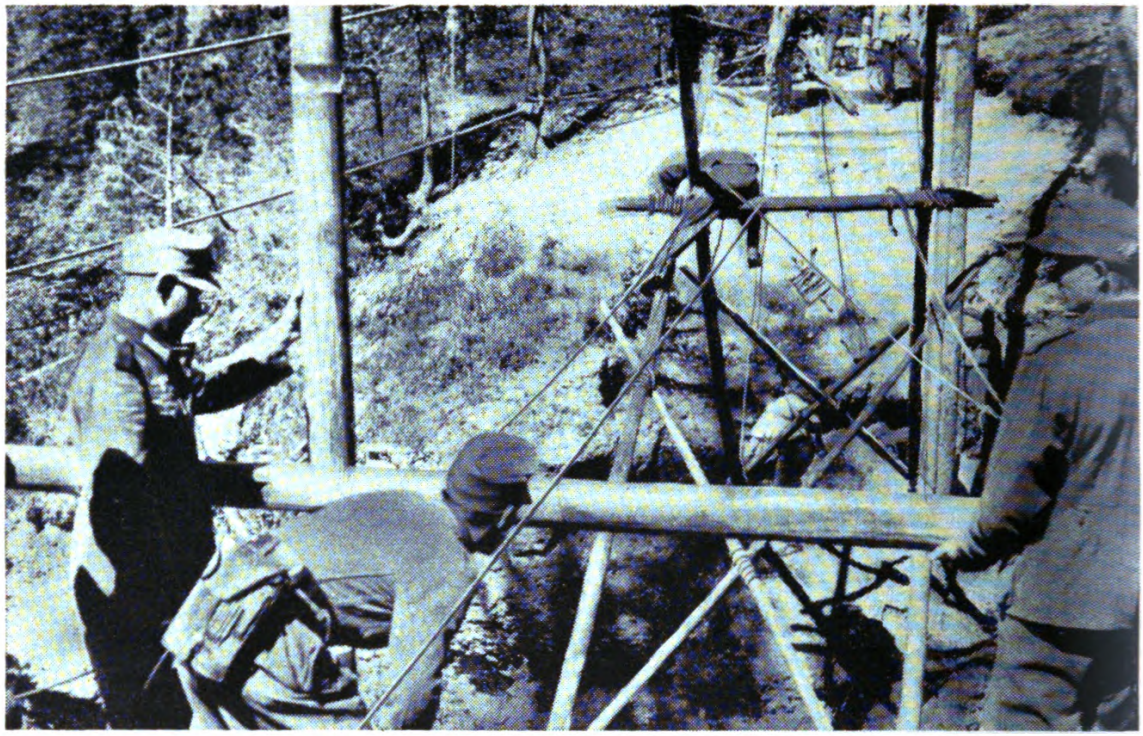
A German mountain engineer uses cables to cross a gorge. For safety he uses his rope, secured to the upper cable with a snaplink. Such cables serve as an emergency bridge over which infantrymen can cross, or as the first step in making a more elaborate bridge.

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In next stage of bridge-building, a single plank footbridge permits transportation of material across the gorge. Ropes holding the bridge are secured to suspension cables by ropes and snaplinks. Gorge is same as that at left.

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The trestle bents and braces of the bridge near completion. All materials except planks and rope have been taken from the surrounding evergreen forest.



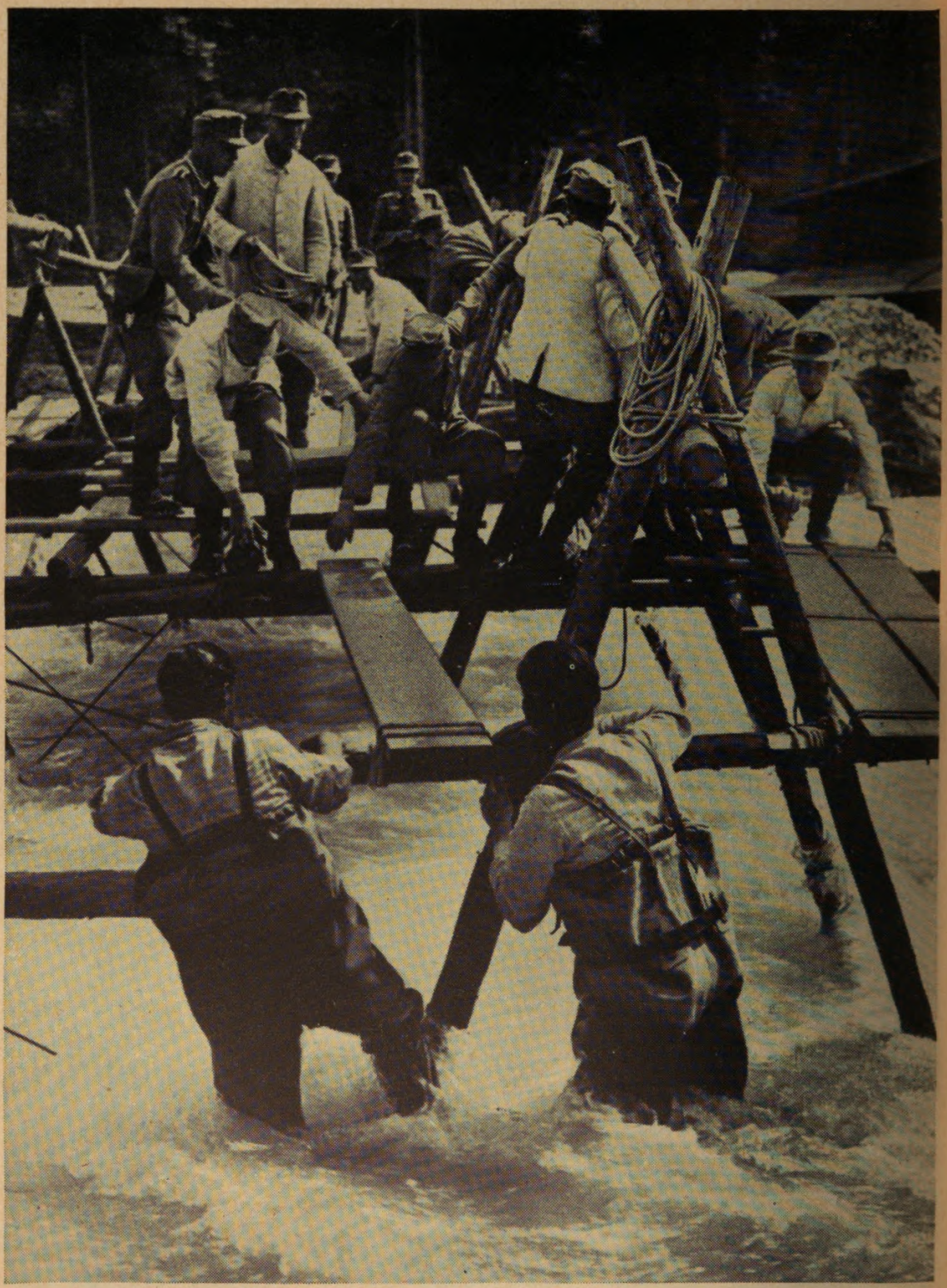
Two mountain engineers use a light-weight gasoline-powered saw to cut timber for a bridge. Light saws vary slightly in design, depending on the maker.

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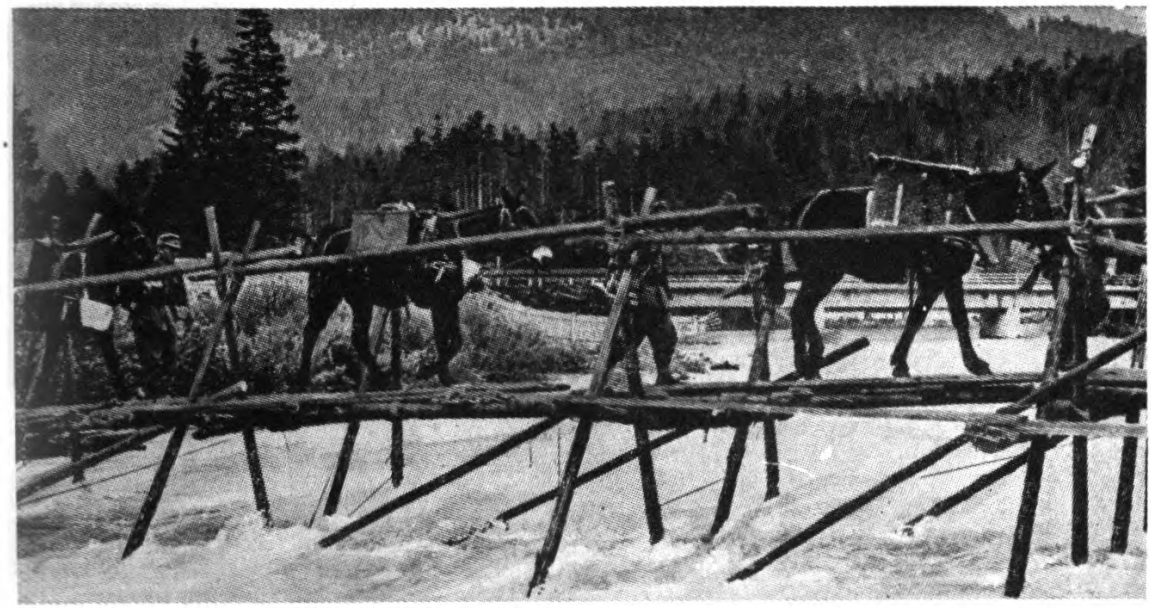
With stringers in place, the bridge is floored with planks. The poles which form the substructure of the bridge are lashed together and secured by ropes.

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A light bridge for men and pack animals is built across a Bavarian mountain stream. Ropes secure the lashed spar trestles and fasten the planking of the flooring. The troops wear white linen fatigue uniforms and armpit waders.

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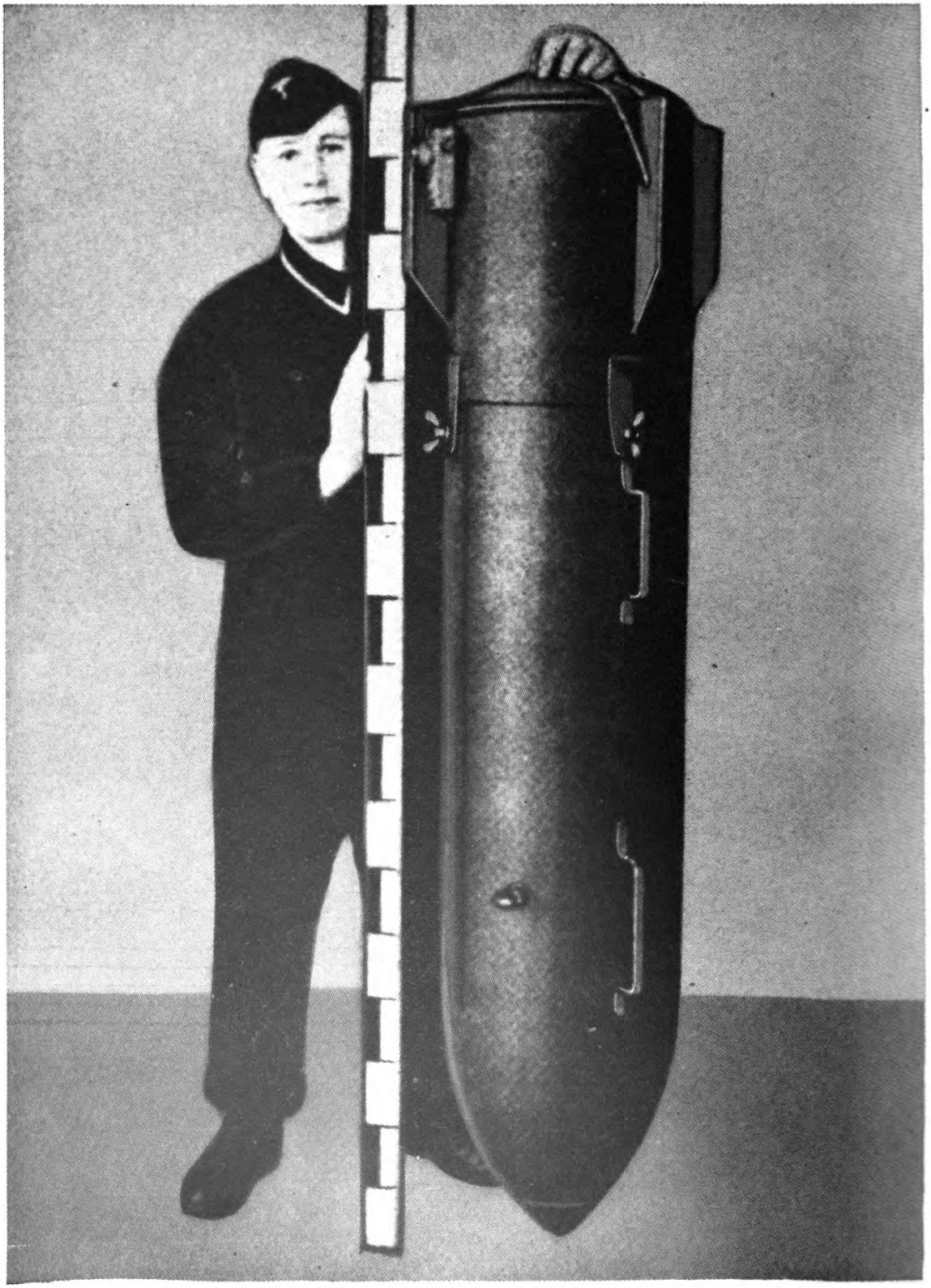


The completed bridge provides an inner roadway of planks, laid on stringers, and two foot ways for personnel; the center roadway is intended for animals.



Mountain engineers also are prepared to launch ponton bridges or to cooperate with other engineers in bridging water courses. In the picture above, mountain engineers, working in water, erect an abutment span.

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The common supply container is 5.5 feet long, weighs 175 pounds empty, carries a maximum load of 375 pounds. It may be loaded with small water containers.

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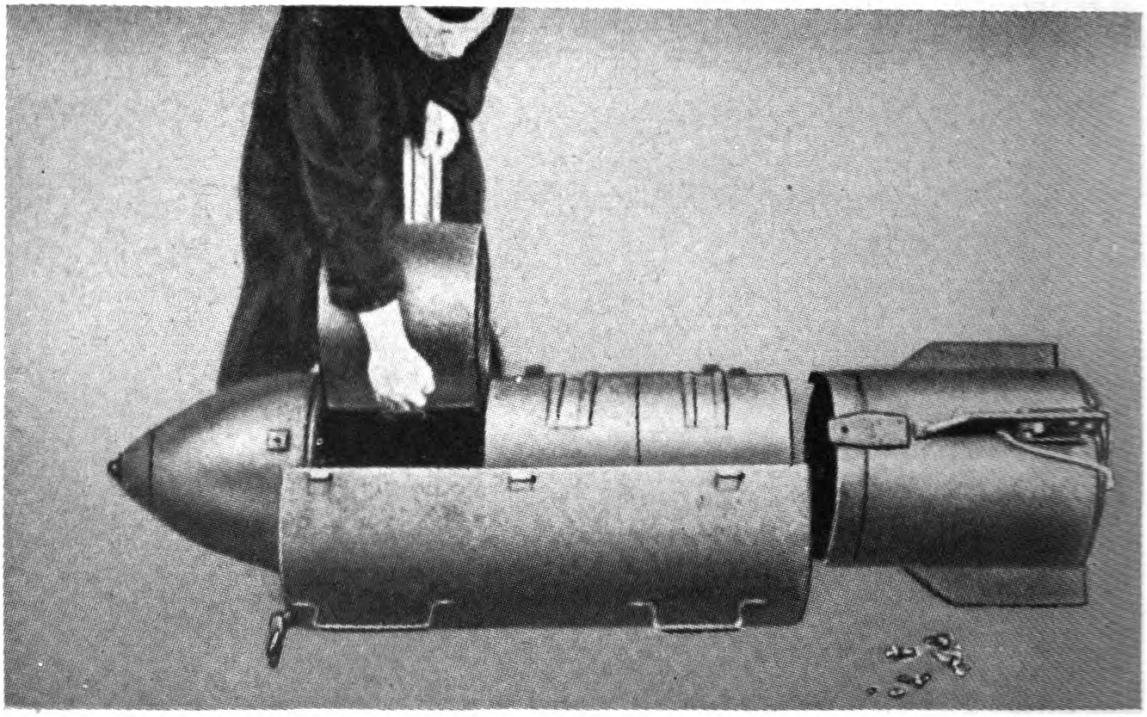
SUPPLY BY AIR

On the Eastern front the Germans developed an extensive system of supply by air to overcome critical tactical situations and traffic difficulties. In mountains limited use has been made of this method because weather and terrain hamper the pin-point accuracy needed to avoid losing dropped supplies. However, German mountain units fighting in marshy or snow-covered terrain, and isolated either by the enemy or by snow and mud, have been supplied successfully with food, munitions, and equipment dropped in containers.



This ammunition container is sturdily built. It weighs 1,100 pounds and may not be dropped from less than 220 feet or at speeds over 180 miles per hour.

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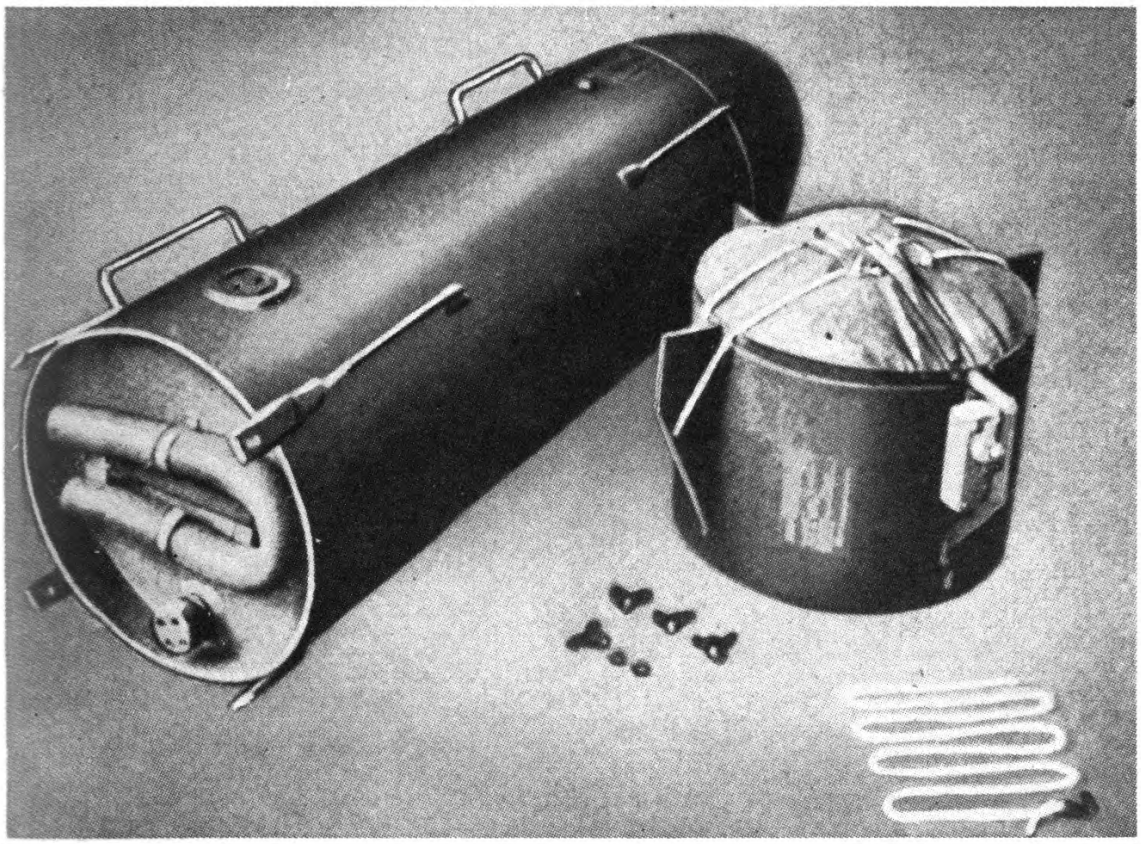


The common supply container is capable of carrying 3 small metal containers. These may be filled with substances which would be damaged if loaded in bulk.

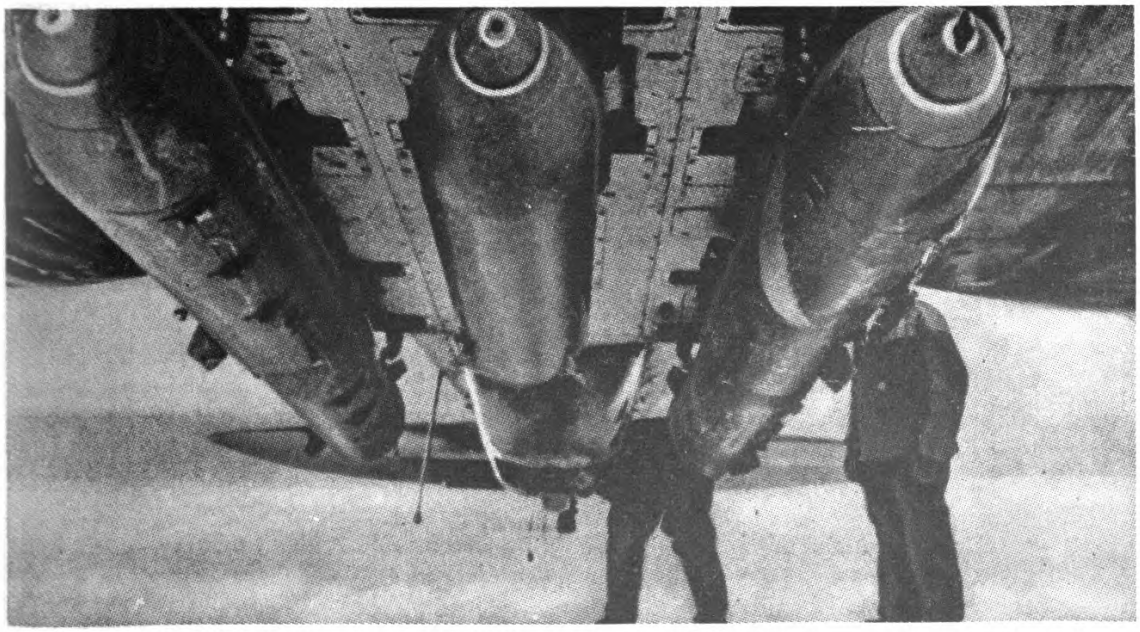


Loaves of bread are loaded into the standard container (see also p. 150 and above). Like French army bread, these loaves have a hard and thick crust.

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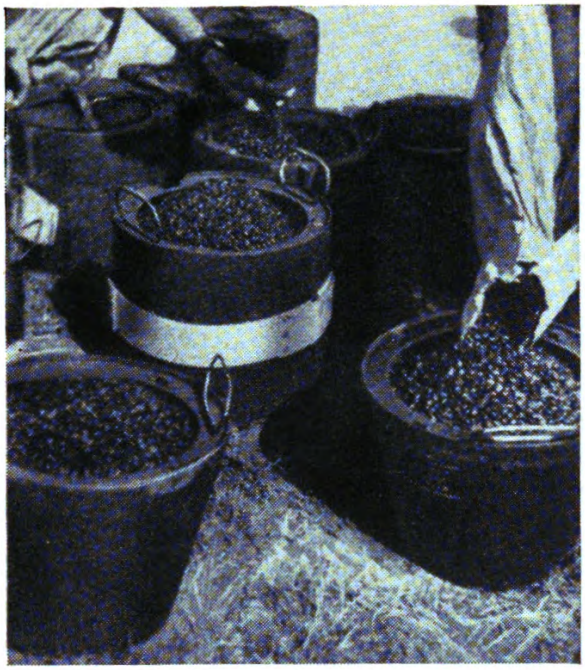


The liquids container is similar in shape to the standard container. At right are chute section, release cord, and bolts to attach chute to container.



On the exterior bomb racks of a Heinkel *He111K* bomber are stowed (left to right) two standard containers, a liquids container, two standard containers.

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Four small containers (see p. 152) are here filled with unground coffee beans.



Standard containers are being thrown from the door of a *Ju52*.



Mountain troops in a Finnish forest have unloaded from a standard container a cylindrical chunk of frozen sauerkraut which they are cutting up. In an emergency shortage, sawdust may be mingled with sauerkraut as food filler.

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Containers are sturdy, appear to suffer little damage on landing, are preserved for re-use. Landing impact is gentle with little bounce as the proximity of the man running out to recover the parachute indicates.

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SHELTER

Because of the frequent, rapid, and extreme changes of weather encountered in high altitudes at all seasons, the Germans very carefully have designed adequate shelters and trained mountain troops in erecting them. Shelters may be made of equipment carried by the men themselves, or, more often, may be constructed out of such materials as the country provides.

Basic equipment for each man includes a quarter section of a shelter tent—a triangle of water-repellent, mottled cloth, which combines with other sections to form a four-man tent and also may be used as a poncho or as a camouflage garment. A mountain tent, which is a light-weight shelter designed to be carried in the rucksack, is issued when needed and furnishes good protection against the cold and winds of alpine regions. At times heavier tents may be provided, but German mountain troops most often rely on emergency or semipermanent shelters which they build themselves.

This reliance on natural materials has its origin in the background of the class of men from whom the German and Austrian *Jägers* (light infantry) were originally recruited. Though *Jäger* literally translated means "hunter", in German the usual meaning is more properly "forester", or "ranger". In Germany, rangers have always been men who patrolled the woods, swamps, and mountains with particular regard to the safekeeping of game. When armies felt the need for troops fitted to operate in trackless, difficult country, they naturally recruited such units from rangers. Addition of the name *"Jäger"* to the unit designation was a

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Mountain troops in the Caucasus have revetted their tents with walls of stone, which furnish a windbreak and offer some protection against shell fragments.



Four sections are needed to make a complete tent; two, a windbreak; three, the type of shelter here used by umpires on a pre-war Bavarian alpine maneuver.

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Pyramidal tents of the kind shown in use in northern Finland are usually too bulky and heavy for mountain troops and so are used only in static situations.



The mountain tent has a standard type of A-shaped vertical section, and here is fitted with an extra front flap and tent pole.

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The simplest form of snow shelter is the snow trench dug in a bank.



The skis placed across the quickly-dug trench are covered with shelter sections.

logical consequence. In the same way, *Gebirgsjäger* were originally recruited from mountain rangers. Though the numbers of present day mountain rangers is too scant to provide more than a stiffening in German mountain units, nevertheless the *Gebirgsjäger* and *Jäger* units carry on the traditions of woodcraft and forest lore handed down from ancient times. German mountain troops and light divisions are thus well accustomed to using local natural materials in the construction of shelters.

These shelters may take the form of hastily devised types for a halt or short bivouac (see pages 166 and 167). They may be prepared on the spot or constructed by advanced parties at appointed bivouac areas. In snow-covered regions, snow trenches or caves may be dug to serve as emergency shelters. Snow houses or igloos are considered superior to tents because they are warmer and do not require materials which have to be transported by men or pack animals. They also furnish better protection from enemy observation and from small-arms fire or shell fragments. When there is no snow, log huts may be built and revetted with stones. These blockhouses provide some security from fire or fragments and can be used as fortifications in case of raids by enemy patrols.

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A snow cave is little more complex than a snow trench; a detail burrows in the side of a snow bank, hollows out a suitable interior, and revets the door.



Inside this snow cave in the Caucasus a mountaineer cooks over a small, efficient gasoline stove. These troops wear the parka with three breast pockets.

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Completed snow houses, here used for ammunition storage, often are revetted with loose snow in order to provide extra warmth and better concealment.



The snow house is built from blocks of snow. Rectangular in shape, it has a large block for a door lintel and larger blocks or shelter tents for roofing.

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Labor Corps youths under guidance of mountain troops prepare to build an igloo. One youth is laying out the circle marking the igloo's perimeter.



For cutting blocks to build igloo walls, the troops use wooden templates to guide the saw in hard snow. Here mountain troops wear the winter uniform.

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Experienced mountain troops can quickly cut snow blocks by eye. Though this shelter is now very much used in winter warfare by other arms, the mountain troops have been accustomed to build igloos on peacetime maneuvers.



According to German experience, igloo walls are best built from hard snow, which can be cut into building blocks. Note that the blocks slant inward.

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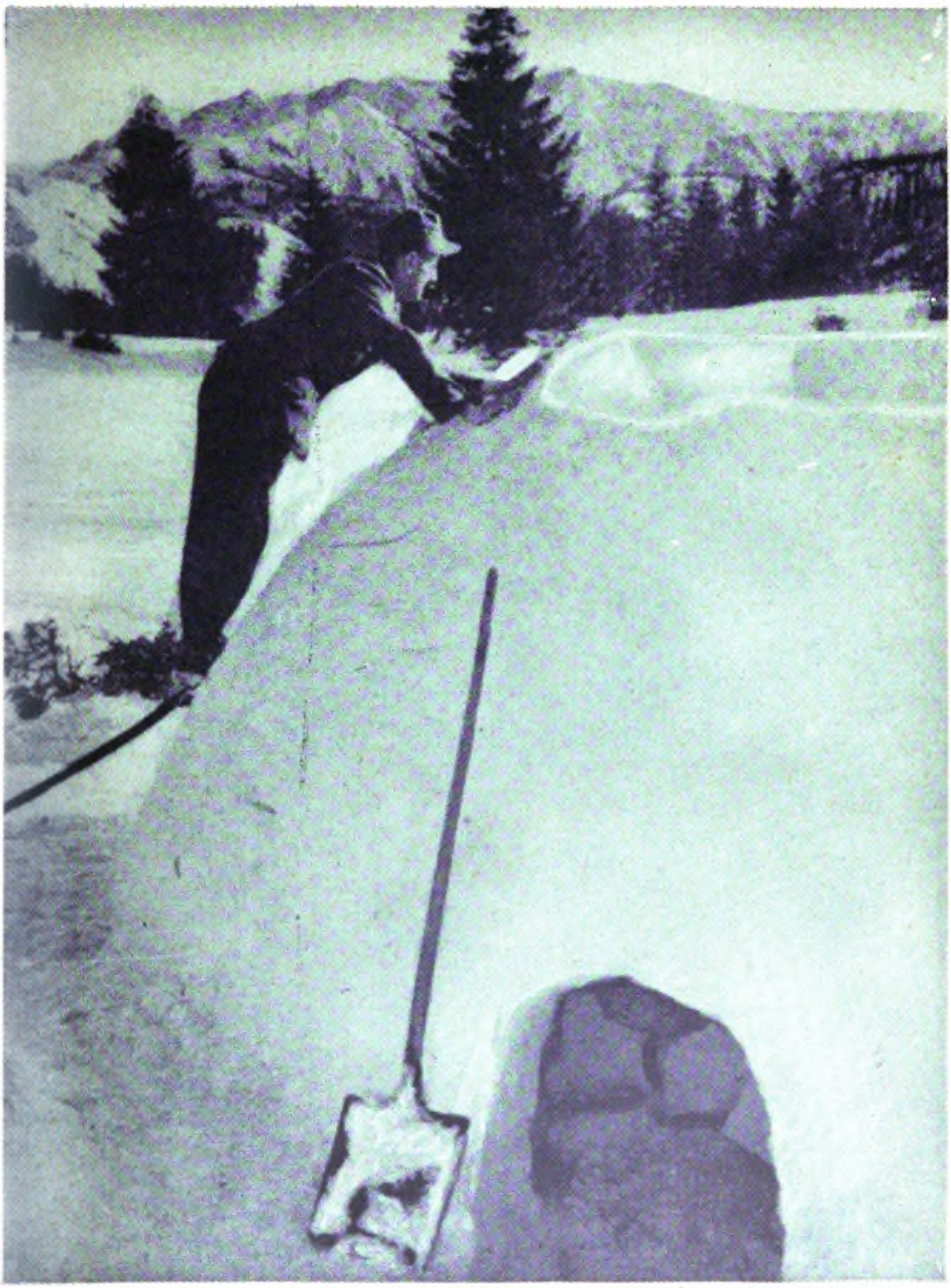


When deep, hard snow is not available, mountain troops can build igloos from irregularly shaped snow chunks, as is being done on this Bavarian maneuver.



German mountain soldiers sometimes improvise igloos from snowdrifts, digging out the interior and building a roof over the excavation. An entrance to an igloo constructed within a snow drift is made by tunneling at floor level.

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Igloos may be built rapidly by skilled men. They may be doused with water to freeze the blocks. This will have a curved tunnel entrance and a snow bank around the base both for warmth and for protection against small-arms fire.

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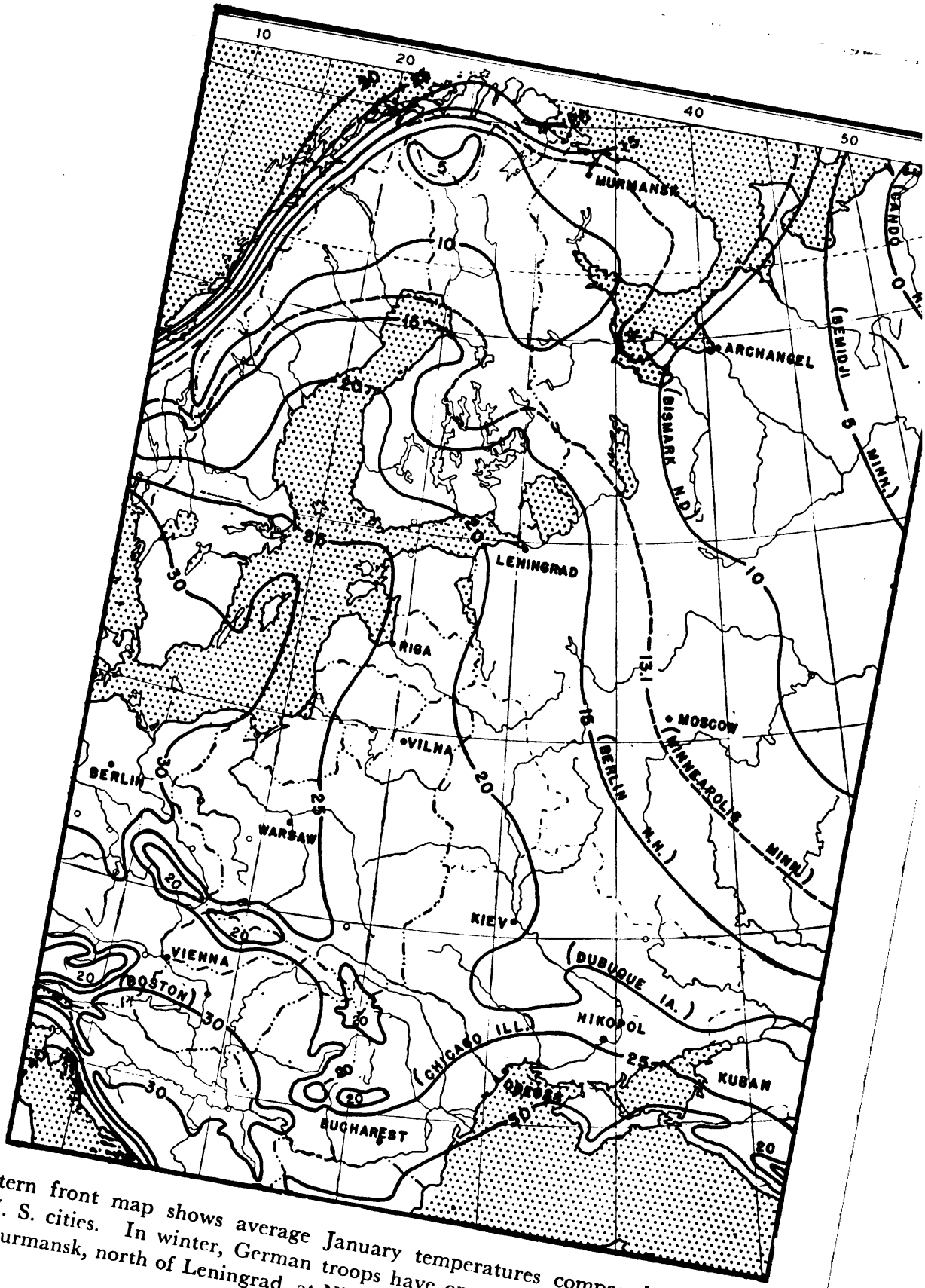
Various types of shelter may be constructed from local materials. Above is a lean-to of birch logs rendered habitable by shelter quarters held in place by logs. This type of shelter is intended for overnight or emergency use. At the left is a hut of swamp grass and turf covering a framework of timber cut from nearby trees. This shelter provides warmth and protection against the moisture of the marsh in which the hut is constructed. Protection against shell fragments is also furnished.

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Another emergency shelter is this pyramidal type being erected in Russia by parka-clad mountaineers. Fir saplings are used for the uprights. These will be filled in by interwoven branches covered with standard shelter quarters.

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Eastern front map shows average January temperatures compared with those of U. S. cities. In winter, German troops have operated in northern Norway, near Murmansk, north of Leningrad, at Nikopol, and in the Kuban.

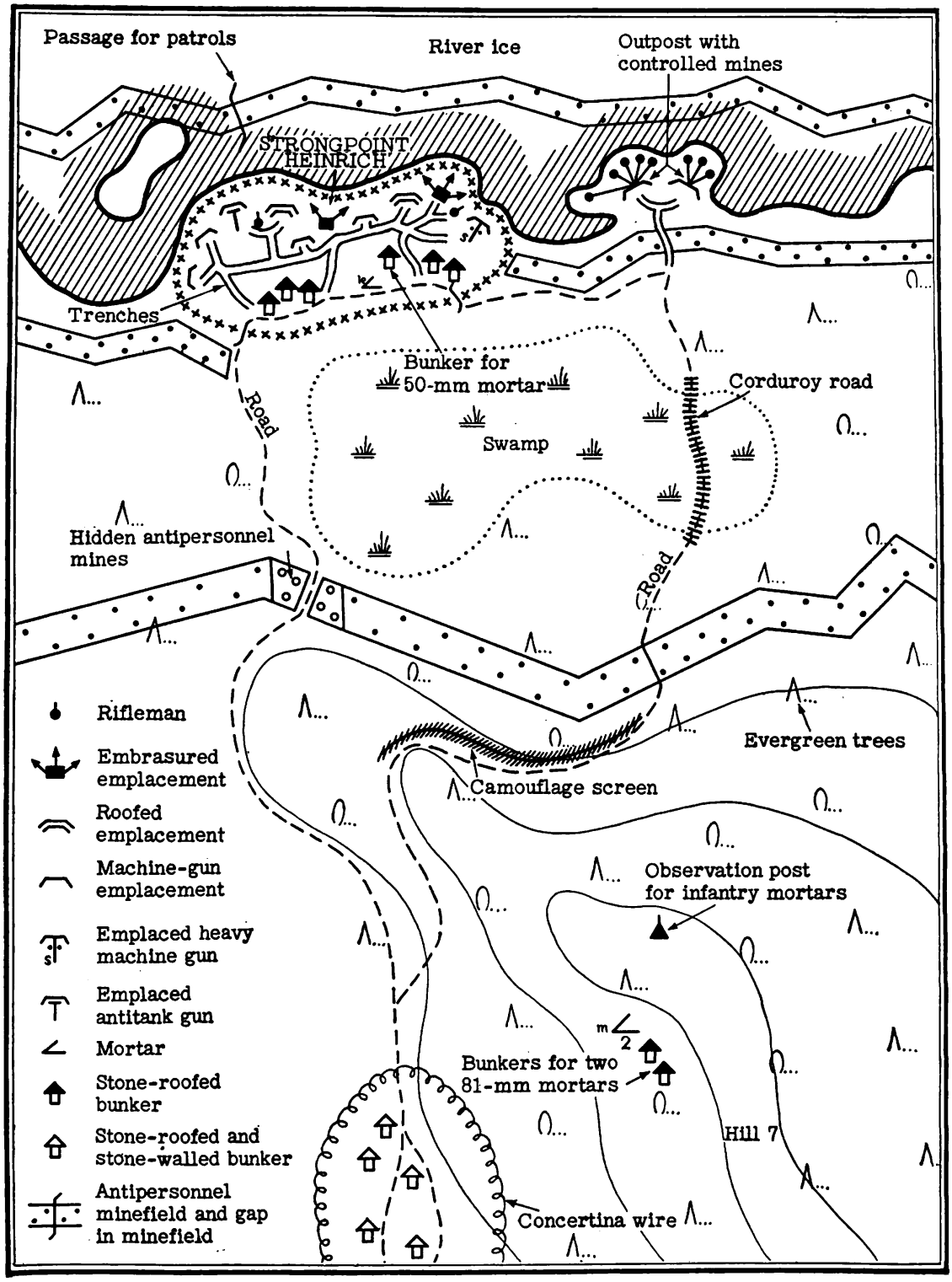
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MOUNTAIN TROOPS IN WINTER

The Russian winter is actually little more severe than winter in many parts of the United States, as the map on the left indicates. The Germans, however, found it rigorous because Germany, like most of Europe, has a comparatively mild climate. The average January temperature in Berlin, for example, is 31.5 degrees Fahrenheit, barely under that of New York and some degrees above that of Boston or Chicago. Except for specially trained mountain units, the Germans were unprepared for conditions that they met on the Eastern front. Recruited largely from the mountains of southern Germany, where cold and snow prevail long before and after winter has come and gone in the valleys and on the plains, these units had been trained in mountain warfare. As mountaineers they had learned to operate in snow and in the muddy thaws of the Bavarian Alps and the Austrian Tirol, and they had been trained as ski troops.

Their training provided a basis for the operations of the German Army in winter. Many of the techniques of German winter warfare were developed from those of the mountain troops and adapted to conditions in the Soviet Union. The mountain troops, moreover, were assigned to crucial and difficult sectors, such as Finnish Karelia, northern Norway, and the Lapland front. The latter two areas have an arctic climate, and the Norwegian sector consists largely of masses of bare rock. The Karelian front, north of Leningrad, is a land of marshes and lakes studded with evergreen forests. In these conditions the mountain troops operated effectively; and along the whole Eastern front mountain tactics and techniques were employed by other units. The following pages show their application to winter warfare.

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This map shows a typical winter position along a river in Karelia. Mountain troops and regular infantry were reported to have operated on the Karelian front. The terrain there favored patrols and surprise raids by ski troops.

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Winter outpost towers are built high to provide observation against surprise by ski troops, and to keep men out of spring mud. Six-foot walls of earth, logs, and stone enclose the men's living quarters.



This tunnel forms part of a mountain rock fortification system occupied by mountain troops in northern Norway.



One tunnel of the system leads to this unfinished firing position made by blasting in the rocky hillside.

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This shallow communication trench of a mountain position in Norway has been reinforced with loose stones. A fire bay is in the center, near the wire.



In typical earthworks mountain troops join with Luftwaffe personnel to guard an airfield. The man in the fire bay has an aircraft machine gun (*M. G. 81*).

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Logs are prefabricated and numbered for bunkers. Loopholes are cut as needed. Bunkers are partly roofed for grenade hurling, roofless for mortar positions.



Observer stands beside *M. G. 34* in outpost tower open on all sides. Roofs are made of layers of logs. A frame for camouflage surrounds the whole structure.

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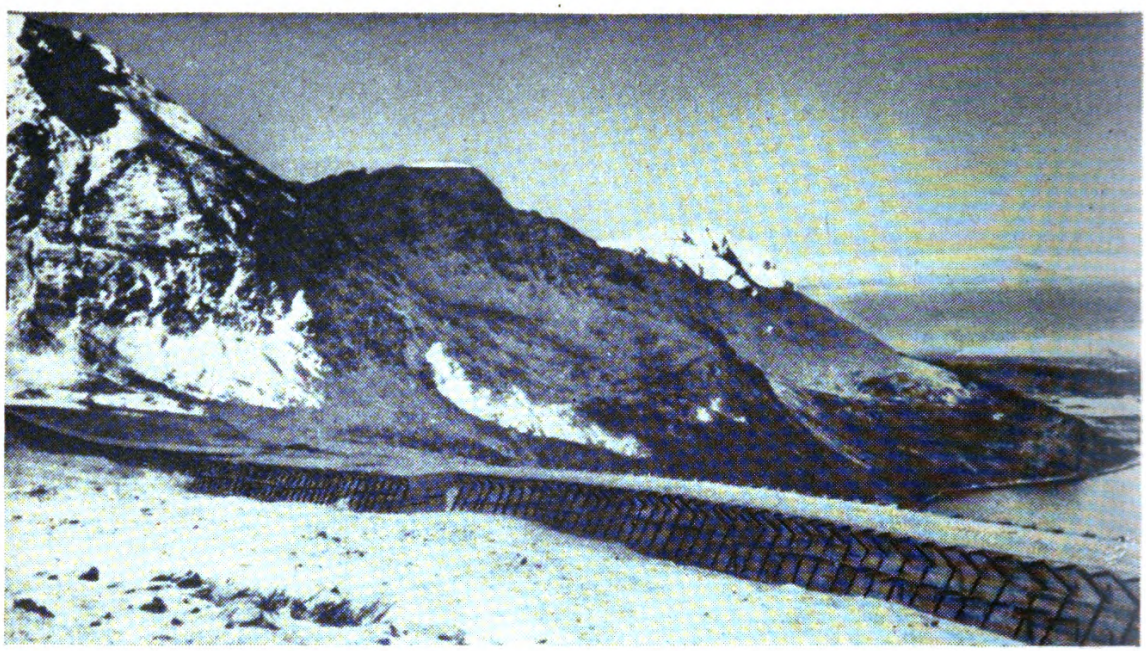
These foxholes are typical emergency winter positions. The new winter uniform is worn white side out, although the ground is not wholly covered by snow. The hardness of the frozen ground prevents digging deeper foxholes.

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In snow conditions emergency entrenchments often consist of snow pits where groups of men can huddle for warmth and protection. Germans deem hard-packed snow walls 8 to 10 feet thick sufficient protection against small-arms fire.

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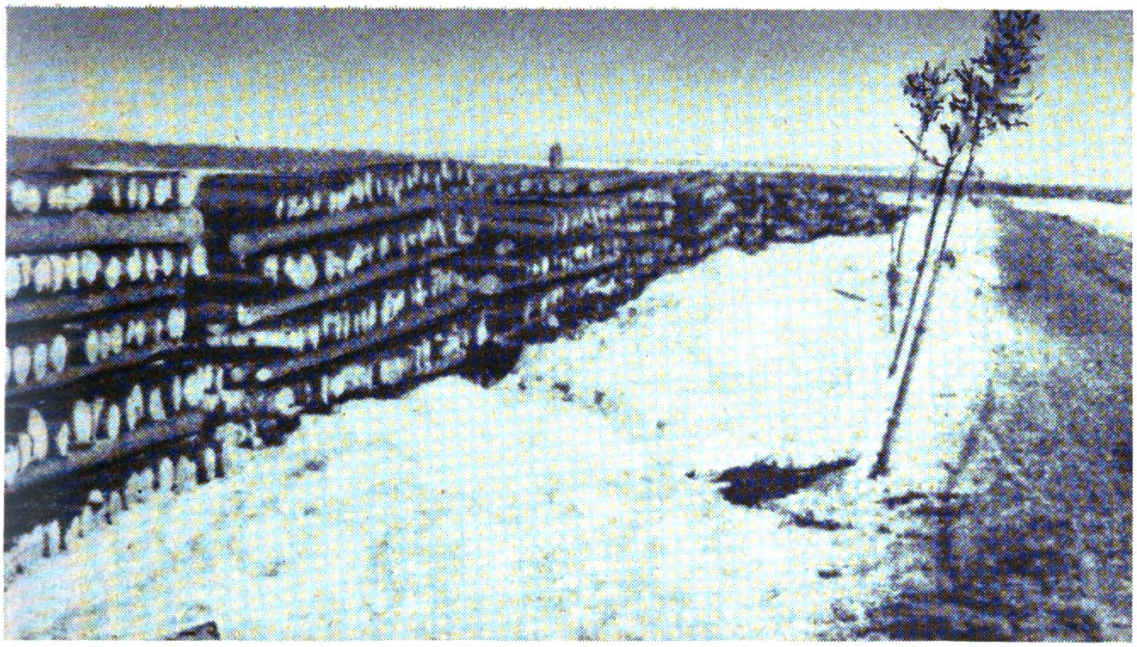


This immense roofed-over road is part of the communication system of mountain troops in Norway. Where the land is bare of trees, lumber must be imported.



The roofed-in road contains two traffic lanes, each about 12 feet wide. The peaked roof is built sufficiently high to give vehicles a 12-foot clearance.

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Timber is cut during the winter, brought up on sleds, and stacked beside the road, where it is available to construct corduroys when the thaw brings mud.



A much-used corduroy road crosses the marshy but timbered country typical of Karelia. Blasted vegetation indicates heavy fighting occurred in this area.

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In Russia a truckload of skis halts at an inspection point. Upper sign carries warning against partisans.



Road report boards are used during winter weather to indicate the condition of necessary supply routes.

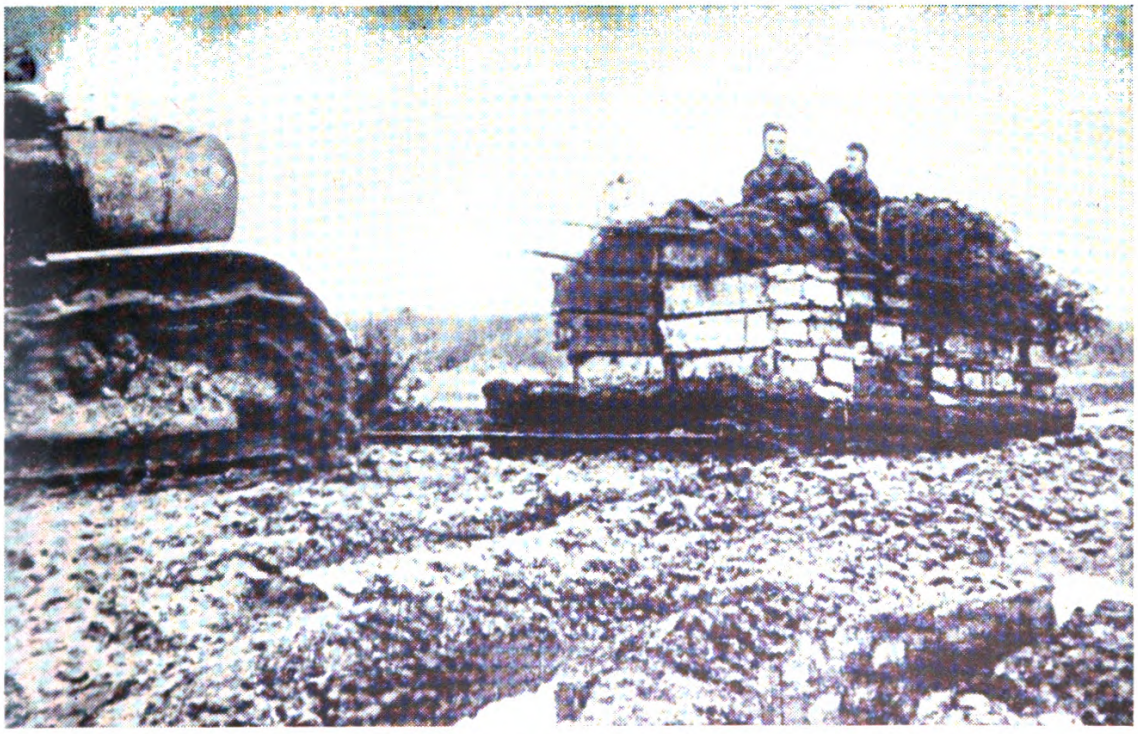


Akajas, light snow boats, are employed to transport supplies, arms, ammunition, and casualties. This partol in Lapland has acquired Swedish-type fur caps.

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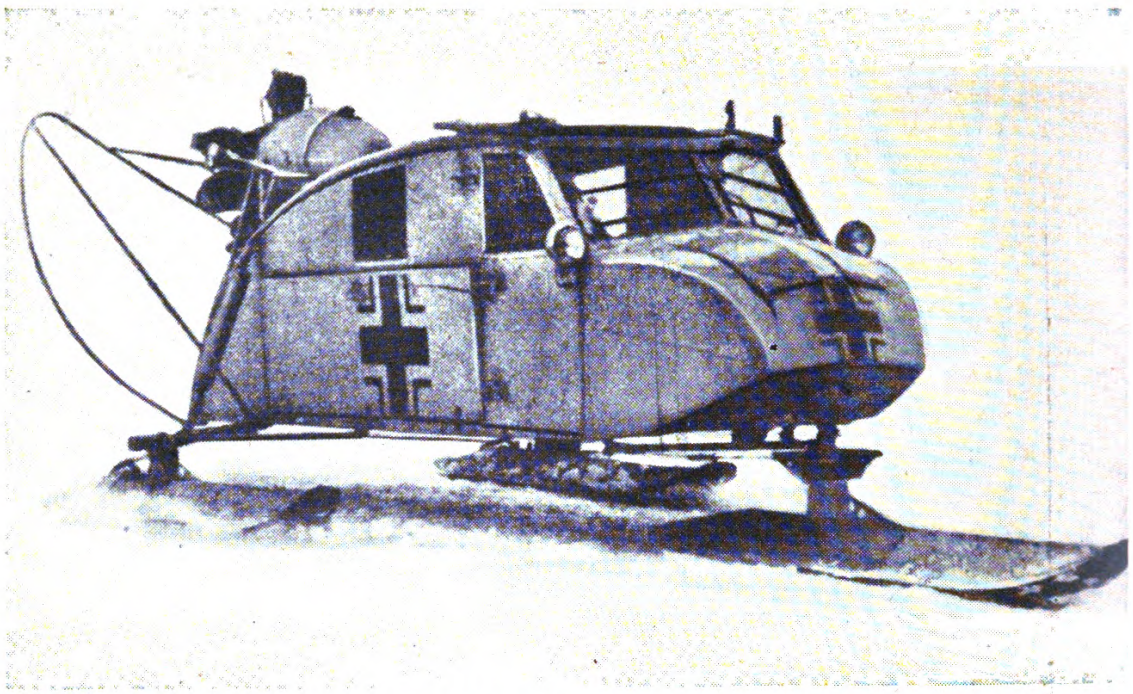


Mud abounds in the fall and winter. These mountain troops are harnessing a team of draft horses which have just recovered from a fall on a mountain road. German mountain troops stress pack animals for transport in muddy terrain.

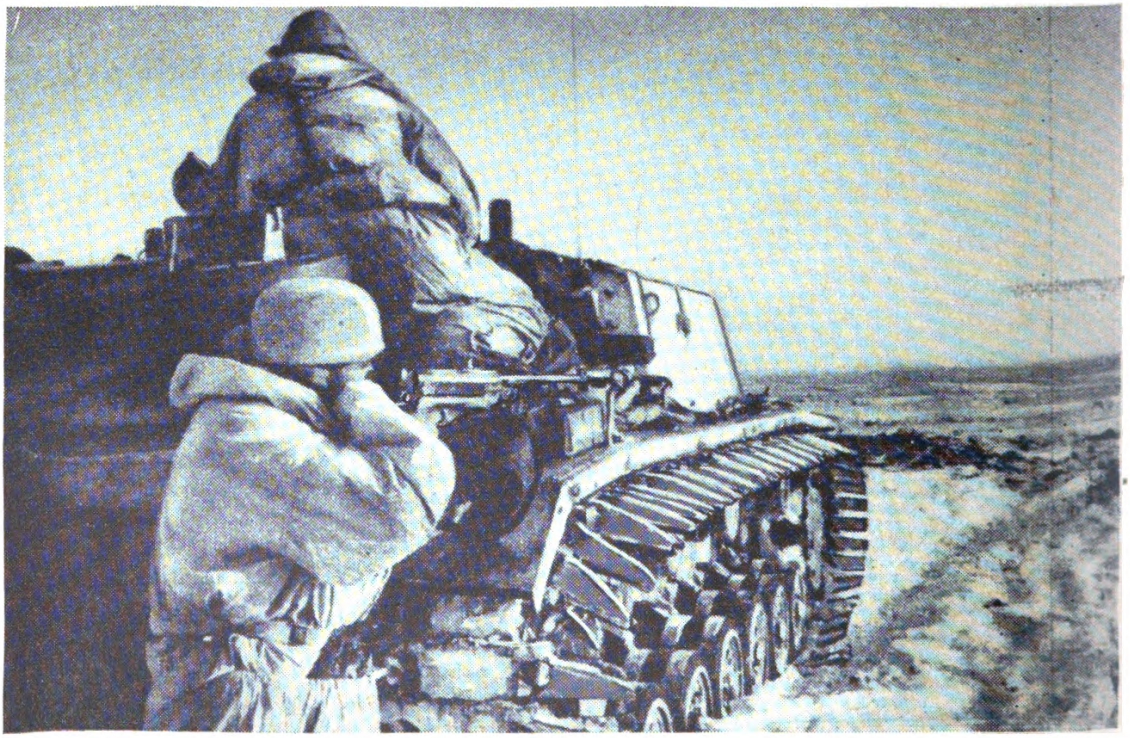


Mud may be so bad that the best form of transport is a tractor-drawn sledge. This improvised sledge, piled with supplies, is drawn by a Russian tractor.

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Radial-engined propeller-driven sleds are used on lakes and terrin free of obstacles. This sled, probably of Russian origin, is evacuating casualties.



The Germans now attach grousers to the tracks of tanks before operating them in snow. The assault gun above has a widened track to prevent its sinking in snow (compare photo at upper right). Grousers are bolted to top of track.

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